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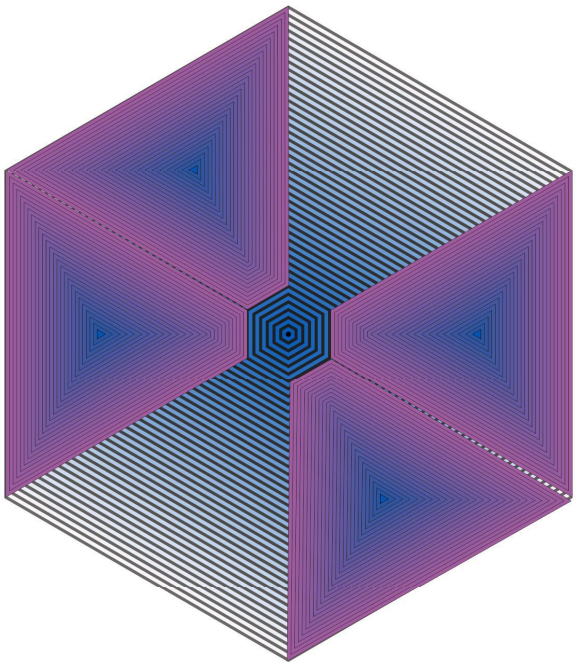

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# Contents

**Editorial**

THE FUNCTIONAL ROLE OF ARTIFICIAL INTELLIGENCE IN WORKING OUT THE CRISIS IN THE REVIEWER POOL
Muammer Çalik ..... 152

**Articles**

PRE-SERVICE TEACHERS' CONCEPTIONS OF "BEING GIFTED" AND "BEING TALENTED": A MULTIMODAL SEMIOTIC APPROACH
Zekai Ayık ..... 155

EFFECT OF BEHAVIOR CONTRACTS ON REDUCING PROBLEM BEHAVIORS AND ENHANCING ACADEMIC ENGAGEMENT IN GENERAL CLASSROOM SETTINGS
Rakan M. Alshammari ..... 176

ADVANCING CRITICAL LITERACY THROUGH CRITICAL LITERATURE PEDAGOGY-BASED PRINCIPLES OF LITERARY EDUCATION
Princess Gerbie C. Durante ..... 196

PREDICTORS OF CONCEPT FORMATION AND EDUCATIONAL CONTEXTUALIZATION COMPETENCIES IN GEOMETRY OF PRE-SERVICE MATHEMATICS TEACHERS
Judel V. Protacio ..... 218

DIGITIZING EDUCATIONAL RESOURCES: DEVELOPMENT OF LEARNING MATERIALS REPOSITORY HUB
Joseline M. Santos, Raquel C. Adriano, Marian Minneli S. Cruz, Mayleen Dorcas B. Castro, Eunice B. Custodio, Gerriper T. Bernardo ..... 237

PARENTS' AND TEACHERS' PERCEPTION OF EFFECTIVE COMMUNICATION AS A MEANS OF PARENTS' INVOLVEMENT IN SCHOOL WORK
Antonija Vukašinović, Bruno Matijašević, Martina Horvat ..... 261

**Information**

INSTRUCTIONS FOR AUTHORS ..... 272

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025
152

# THE FUNCTIONAL ROLE OF ARTIFICIAL INTELLIGENCE IN WORKING OUT THE CRISIS IN THE REVIEWER POOL

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Becoming reviewers is absolutely a volunteer process to ensure the credibility and reliability of any scientific/academic paper and requires them to spend their spare time to review and improve the quality of the submitted papers. Editors try to do their best to find qualified reviewers, who can provide timely and high quality feedback within the scheduled review period. An increase in the number of educational research journals calls for much more reviewers and boosts their workloads with frequent invitations. For example, Scopus indexes 1593 journals for education and social sciences in 2024 while Web of Science has 760 journals in Social Science Citation Index (SSCI) for education and educational research and 86 journals in Emerging Sources Citation Index (ESCI) for education and scientific disciplines. Similarly, Turkish Index (TR Dizin), Education Resources Information Center (ERIC), H.W. Wilson, Australian Education Index and British Education Index cover dozens of journals. Even though the number of journals has been increasing year by year, the reviewer pool has slightly been extended. In other words, nearly all of them use the same reviewer pool. Therefore, receiving too many invitations for reviewing the submitted papers creates a high pressure on the potential reviewers, who are well-qualified in reflecting their in-depth knowledge of the subject matter and methods (Bauchner & Rivara, 2024). Unfortunately, most of them immediately decline from the invitations without any reason and suggesting other potential reviewers. Thereby, the review rounds take much more time than the expected one. Although all potential authors consider the journals' metrics (e.g., submission to first decision, submission to first post-review decision, acceptance to publication) to select the fastest ones, few of them are volunteer to act as reviewers for other submitted papers. Given my editorial experiences, two of nine invited reviewers accept the invitation for the review process. This makes the current peer review system imbalance and highlights the importance of sustainability in the publication process (BaHammam, 2025; Bauchner & Rivara, 2024). In fact, I have declined several reviewing invitations from different journals I am not affiliated. Therefore, I have a great empathy with the reviewers, who decline the invitation for the review process. I could not imagine how to effectively manage our working hours if we, as reviewers, accepted all invitations. In fact, the journals offer some perks and incentives (e.g., credits for future publication, free access to the publisher's journals, databases and books, and certification for reviewing) for the reviewers to draw their attention and foster them to accept the invitations. BaHammam (2025) states that monetary compensation and publication credits are more attractive for the potential reviewers than free access to the publisher's journals and certification for reviewing. However, he emphasizes that small and national journals could not meet such financial rewards. Therefore, scientific/academic publishing needs alternative tools, which are time-efficient, economic and effective (BaHammam, 2025; Bauchner & Rivara, 2024; Biswas, 2024; Yorukoglu, 2024).

Given the role of artificial intelligences (AI) (e.g., ChatGPT, Gemini, DeepSeek) in editing the manuscripts and suggesting alternative modelling, the scientific community has been

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


inquiring whether it could overcome the crisis in the reviewer pool and peer review process and lessen the journals' workloads and burdens (BaHammam, 2025; Bauchner & Rivara, 2024; Biswas, 2024; Yorukoglu, 2024). As a matter of fact, Yorukoglu (2024), who compared the human and AI (ChatGPT and Gemini**)** peer review reports with each other, reported that they suggested similar comments despite some differences, e.g., AI reports are longer and contain indirect expressions although they lack the core and general perspective of the manuscript. Similarly, BaHammam (2025) mentions that AI and human reviews have similar scoring for the review process although AI is better at identifying technical (e.g., the suitability of the manuscript to the journal's guidelines), and methodological issues (e.g., detecting statistical inconsistencies) than evaluating novelty or originality of the manuscript. This means that AI could reduce the reviewer burnout and speed up the review procedure even though ChatGPT and Gemini express the same comments in different ways and do not specialize their comments alike human reviews (BaHammam, 2025; Yorukoglu, 2024). However, AI has limitations in criticizing and assessing the novelty of any manuscript, which acts as a cornerstone for the peer review system to decide how well it contributes to the current scientific literature (BaHammam, 2025). Also, AI directly threatens confidentiality and trustworthiness of the peer review process because commercial AI platforms do not guarantee confidentially storing the uploaded manuscripts for the peer review process (BaHammam, 2025). Phrased differently, these platforms incorporate its own risks in terms of data privacy and intellectual property protection (BaHammam, 2025; Biswas, 2024). In fact, this calls for journals/publishers to generate their own AI platforms to ensure confidentiality, trustworthiness and security of the peer review process.

Whatever the authors can upload their manuscripts to AI platforms for proofreading and editing (Biswas, 2024), the journals require them to clearly declare this process in their manuscripts. Because the authors take their own responsibility and address their consents for the use of AI platforms, the journals see it as a regular procedure. However, it is absolutely different in the peer review system since the authors do not have any consent form that the reviewers can use AI platforms for their manuscripts. Indeed, this process directly threatens copyright agreement and data privacy because the manuscripts may involve sensitive information or findings that are specific for the peer review process (Bauchner & Rivara, 2024; Biswas, 2024). If commercial AI platforms store these manuscripts including unique and unpublished findings and exploit them to produce their responses to other inquiries or prompts by placing the submitted manuscripts in the public domain (Bauchner & Rivara, 2024), the journals may encounter some hard legal and lawsuit processes in terms of data privacy and intellectual property protection. Therefore, the journals should immediately add this issue into their guidelines for the reviewers to declare that this responsibility is absolutely belonging to the reviewers, who casually upload the manuscripts to commercial AI platforms. On the other hand, if the journals ask the authors to declare whether they give any permission about the use of commercial AI platforms in the peer review system, they can use them to expedite initial editorial processes (e.g., technical issues) in a shorter time. In fact, the editors should carefully check these feedbacks in terms of consistency, accuracy and correct use since commercial AI platforms suggest several feedbacks without contextualizing them for a specific research field or domain-specific expertise (Biswas, 2024). It is obvious that such a trend seems to increase the editorial workloads although AI acts as a complementary tool for the peer review system with the consent form (BaHammam, 2025). Phrased differently, unless the journals have their own AI platforms to ensure the trustworthiness amongst the authors, reviewers and editors, AI seems not to solve the crisis in the peer review system since it does not aim to replace the real expert judgment (BaHammam, 2025). Given the cost of owning any AI platform, non-profit or small publishers/journals will have still been challenging this crisis to find qualified reviewers,

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


who critically evaluate the novelty of any manuscript.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
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# PRE-SERVICE TEACHERS' CONCEPTIONS OF "BEING GIFTED" AND "BEING TALENTED": A MULTIMODAL SEMIOTIC APPROACH

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## Abstract

*Teachers' conceptions of gifted and talented students significantly influence their nomination skills and teaching practices. However, research indicates that these conceptions are often incorrect or inconsistent, even among teachers who have completed coursework in gifted and talented education. This study aimed to explore pre-service teachers' conceptions of "being gifted" and "being talented" using a qualitative case study research design with 35 participants. Data were collected using a multimodal instrument that allowed participants to express their mental representations through various modes such as writing, drawing, and mathematical symbols. The collected data were then analyzed using a multimodal semiotic analysis protocol developed specifically for this purpose. The results revealed that participants predominantly associated "being gifted" with cognitive abilities such as high IQ, scientific inquiry, and mathematics, while "being talented" was linked to cognitive, affective, and psychomotor abilities, including high performance in arts and sports. The findings highlight the need for pre-service training programs that promote scientific conceptions of giftedness and talent, addressing stereotypes and lay misconceptions.*
**Keywords**: *gifted education, gifted students, multimodal analysis, talented students, teacher conception*

## Introduction

Gifted students are a special group with distinctive educational needs that span both cognitive and non-cognitive domains. Supporting these learners effectively requires not only academic enrichment but also attention to their socio-emotional development, motivation, and affective characteristics. These students benefit from specialized educational provisions tailored to their unique learning profiles (Davis et al., 2014; Subotnik et al., 2011). Teachers play a pivotal role in addressing these needs, as their conceptions of "giftedness" and "talent" significantly impact their nomination decisions and instructional strategies (Godor, 2019; Golle et al., 2023). Accurate conceptions are crucial for identifying gifted students early, fostering positive peer interactions, creating an inclusive classroom climate, and employing effective teaching practices (Baudson & Preckel, 2016; Missett et al., 2014). This underscores the importance of exploring teachers' conceptions to enhance teacher training and better support gifted and talented students.

In this vein, numerous studies have investigated teachers' knowledge, attitudes, and beliefs about giftedness, talent, and gifted/talented students, revealing significant misconceptions and inconsistencies. For example, Sumpter and Sternevik (2013) found that pre-service teachers often attribute giftedness to both cognitive and non-cognitive traits, such as high intelligence, creativity, and personality features. Similarly, Altıntas and Ilgun (2016) reported that teachers associate giftedness with creativity, academic performance, and congenital traits, but their perceptions are often shaped by stereotypes and myths. Heyder et al. (2018) developed

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


a knowledge test for assessing teachers' understanding of giftedness and found widespread misconceptions, even among experienced teachers, which could hinder effective teaching practices. These misconceptions often result in either idealized or negative attitudes towards gifted students, as demonstrated in studies by Troxclair (2013) and Baudson and Preckel (2016). According to Heyder et al. (2018), teachers' conceptions encompass both knowledge and attitudes, with the former influencing the latter. These studies imply that teachers' knowledge can originate from diverse sources, including scientific literature, personal experiences, and cultural representations in media, which may perpetuate stereotypes and myths. Voss et al. (2011) emphasized that teachers' conceptions should align with scientific pedagogical-psychological knowledge (PPK), encompassing knowledge about learners, learning processes, and instructional strategies. Such knowledge is critical for fostering professional competence in teaching diverse student populations, including gifted and talented learners.

### *"Gifted" and "Talented" Concepts in Theory*

The concepts of giftedness and talent have been explored through various theoretical lenses, with four primary approaches dominating the discourse: domain-general definitions, domain-specific definitions, system models, and developmental models. The domain-general approach, grounded in early studies by Terman, equates giftedness with general intelligence, often measured by high IQ scores (Terman, 1925). This perspective views giftedness as a one-dimensional construct centered on cognitive ability. In contrast, the domain-specific approach, championed by Thurstone, challenges the idea of a single "g-factor" of intelligence (Thurstone, 1938). It emphasizes independent cognitive abilities, such as verbal comprehension, numerical aptitude, and spatial reasoning, allowing for a more diverse understanding of giftedness. Third, system models, such as Renzulli's Three-Ring Model, take a multidimensional approach by incorporating creativity, task commitment, and above-average ability as necessary components of giftedness (Renzulli, 2005). These models highlight that without all elements in balance, giftedness may not manifest. Lastly, developmental models, like Gagné's Differentiated Model of Giftedness and Talent (DMGT), distinguish between innate abilities (gifts) and cultivated skills (talents) (Gagné, 2013). Gagné emphasizes that talent emerges through the transformation of natural abilities into domain-specific expertise via systematic practice and environmental support. The developmental models collectively underlined the multifaceted nature of giftedness and talent, with distinctions between potential and performance, cognitive and non-cognitive traits, and innate versus developed abilities. The developmental models shed a light on the talent development processes and the internal and external factors affecting the transformation of genesis-based skills into talents in performance fields through appropriate educational provisions (Merello, 2024).

In general, gifted students are typically characterized by exceptional cognitive abilities, such as creativity, academic achievement, problem-solving, and curiosity and non-cognitive abilities (Davis et al., 2014; Eysink et al., 2017). Non-cognitive attributes, including motivation, autonomy, and social adaptability, also play a significant role in distinguishing them from their peers (Heyder et al., 2018; Tourreix et al., 2023). Talented individuals, on the other hand, are often seen excelling in specific domains like sports, arts, or leadership, showcasing psychomotor skills and creative potential (Gagné, 2013). While the terms "gifted" and "talented" are often used interchangeably, these theoretical models suggest nuanced differences, which are essential for tailoring educational approaches to meet students' unique needs and understanding the talent development processes. In this context, Gagné's model posits that natural abilities (gifts) are transformed into talents in specific performance or occupational areas through a well-designed educational process that integrates internal and external factors, with teachers playing a critical role (Gagné, 2013).

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


### *Teachers' Conceptions*

Teachers' conceptions of giftedness play a pivotal role in shaping their ability to identify and address the needs of gifted students (Bildiren, 2018; Golle et al., 2023; Şahin & Levent, 2015). These conceptions encompass both cognitive knowledge and affective beliefs, which influence their attitudes, classroom practices, and overall effectiveness in teaching gifted learners. Research highlights the importance of pedagogical–psychological knowledge (PPK) as a foundation for understanding the diverse cognitive and non-cognitive traits of gifted students, including motivation, creativity, and social-emotional needs (Heyder et al., 2018; Voss et al., 2011). Despite its significance, many teachers hold misconceptions about giftedness, often equating it solely with academic achievement or high IQ, while overlooking other attributes. These misconceptions are frequently rooted in stereotypes or inadequate or inappropriate training, which can lead to inconsistent practices in identifying and supporting gifted students. For example, Heyder et al. (2018) found that even experienced teachers often focus on academic traits while neglecting social or emotional factors. Similarly, societal stereotypes portray gifted students as either intellectually superior or socially maladjusted, further shaping teachers' beliefs and practices. Such narrow views can hinder inclusive practices and perpetuate inequities, as teachers may fail to recognize gifted students who do not conform to these stereotypes (Baudson, 2016; Carman, 2011). Troxclair (2013) highlighted that teachers' attitudes–whether positive or negative–significantly influence their strategies and interactions with gifted learners, affecting their ability to foster supportive classroom environments. While positive attitudes generally correlate with more effective teaching practices, misconceptions can lead to biases in student identification and instruction. Conflicting perspectives, such as the harmony hypothesis (which views gifted students as well-rounded) and the disharmony hypothesis (which highlights emotional or social challenges), further complicate teachers' conceptions and approaches (Baudson, 2016). Ultimately, personal experiences, cultural influences, and limited exposure to evidence-based training contribute to the persistence of these misconceptions, underscoring the need for comprehensive teacher education to address these gaps.

### *Multimodal Semiotic Approach to Examining Conceptions*

Commonly used methods of exploring teachers' conceptions, such as interviews or questionnaires, often fail to capture the implicit, non-verbalized dimensions of their understanding. This study employs a multimodal semiotic approach (Jewitt et al., 2016), which integrates diverse modes of expression–written language, visual imagery, and mathematical symbolism–to provide a comprehensive view of teachers' mental representations. This approach is employed parallel to Karmiloff-Smith' (1992) Representational Redescription Theory, which posits that knowledge exists at both implicit and explicit levels, necessitating methods that go beyond verbal articulation. Multimodal analysis enables the study of ideational meaning (content and attributions), interpersonal meaning (attitudes and values), and textual meaning (coherence and structure) (Ayik, 2021). For example, teachers' use of visual or symbolic representations can reveal implicit biases or stereotypes that may not surface through verbal explanations. By analyzing teachers' multimodal expressions of "gifted" and "talented" constructs, this study aims to uncover hidden dimensions of their conceptions, providing insights into how these views can be refined through targeted training.

### *Theoretical Framework*

This study is guided by Gagné's Differentiated Model of Giftedness and Talent (DMGT), which provides a robust theoretical foundation for distinguishing between natural abilities

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025



(gifts) and systematically cultivated skills (talents). According to Gagné, giftedness represents innate aptitudes that span four domains: intellectual, creative, socio-affective, and sensorimotor (Gagné, 2013). These natural abilities exist as raw potential, which, when nurtured through environmental factors and deliberate practice, transform into talent, characterized by high-level performance in a specific domain, such as academics, arts, sports, or leadership. This framework underscores the importance of recognizing both the inherent potential and the developmental trajectory required to achieve excellence. In this study building on the DMGT, this study evaluates pre-service teachers' conceptions of "being gifted" and "being talented" by examining the following dimensions:

1. Attributed Learning Skills: Teachers' conceptions of giftedness often focus on cognitive abilities such as problem-solving, creativity, and academic performance. These skills are complemented by non-cognitive traits, including motivation, curiosity, and socio-emotional adaptability. This study explored which cognitive, affective, and psychomotor abilities participants attribute to gifted and talented students and how these attributions align with theoretical models like DMGT.

2. Utterances or Appearances: Gifted and talented students are often identified through observable behaviors, such as exceptional academic performance, creative expression, or leadership abilities. This part is related to how teachers depict or show teacher in doing something.

3. Occupational Fields: Gagné's model emphasizes that talents manifest in specific domains or occupational fields, ranging from the arts and sciences to athletics and leadership. This study explored how pre-service teachers associate giftedness and talent with particular professional or academic pathways, reflecting their implicit beliefs about the long-term potential of gifted individuals.

4. Attitudes Toward Giftedness and Talent: Teachers' attitudes, shaped by their conceptions, significantly influence how they engage with gifted students in the classroom. This study examines how pre-service teachers articulate these behaviors and how their descriptions align with the harmony or disharmony hypotheses. The harmony hypothesis posits that gifted students excel in both cognitive and non-cognitive domains, while the disharmony hypothesis suggests they may face socio-emotional or behavioral challenges (Baudson, 2016). This study evaluated whether participants view gifted students as well-rounded and harmonious or socially and emotionally fragile, reflecting either positive or negative biases.

### *Aims and Research Questions*

Despite the inclusion of coursework on gifted and talented education in many teacher preparation programs, persistent misconceptions among pre-service teachers remain a concern (Carman, 2011; Persson, 1998). These misconceptions often stem from culturally embedded stereotypes, a lack of exposure to scientific models, and limited real-world experience with gifted learners. Prior research exploring teacher conceptions has primarily relied on interviews, surveys, and metaphor-based tasks, methods that focus on linguistically articulated and explicit knowledge (Reis-Jorge et al., 2021). However, such approaches may not fully capture the nuanced, and sometimes implicit, understandings that shape how teachers perceive and respond to giftedness.

Drawing on Karmiloff-Smith's (1992) representational redescription theory, it is important to recognize that knowledge can exist across different levels of consciousness, including forms that are not readily accessible through verbal explanation. This has significant methodological implications: limiting research to linguistic modes risks overlooking critical aspects of pre-service teachers' mental representations. As Heyder et al. (2018) noted, pedagogical-psychological knowledge is multifaceted, and its expression may extend beyond

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


language. To address this limitation, the current study adopted a multimodal semiotic approach (Baldry & Thibault, 2010), enabling participants to express their ideas using a variety of semiotic resources, including language, visual imagery, and symbolic representations such as mathematical notation. This framework allowed for a richer and more holistic understanding of how giftedness and talent are conceptualized by future educators.

This study is also motivated by a second major gap in the literature: the interchangeable use of the terms "gifted" and "talented", both in research and educational practice. While often conflated, these terms have distinct meanings in contemporary talent development theories. Gagné's (2013) DMGT made a clear distinction between gifts–innate, natural aptitudes–and talents, which are developed systematically over time through learning, practice, and environmental support. The failure to distinguish between these concepts may contribute to confusion about the nature of ability, as well as about how educators should identify and nurture different forms of potential.

Against this backdrop, the present study explored pre-service teachers' conceptions of "being gifted" and "being talented" using Gagné's DMGT as a theoretical foundation. By combining this model with a multimodal methodological design, the study sought to generate insights into both the content of these conceptions and the forms through which they are expressed.

Based on this rationale, the study aimed to address the following research questions:

1. How do pre-service teachers conceptualize "being gifted" in terms of attributed learning skills, observable utterances, occupational fields, and attitudes?
2. How do pre-service teachers conceptualize "being talented" in terms of attributed learning skills, observable utterances, occupational fields, and attitudes?
3. What modes and semiotic resources do pre-service teachers utilize to express their conceptions of "being gifted" and "being talented"?

## Research Methodology

### *Research Design*

This study employed a qualitative case study design to investigate how pre-service mathematics teachers conceptualize the constructs of "being gifted" and "being talented." A case study was chosen because it allows for an in-depth, context-sensitive exploration of a bounded phenomenon–in this case, the participants' multimodal representations of giftedness and talent within their pre-service training context (Yin, 2018). The study is theoretically grounded in social semiotics and the principles of multimodality, which view communication as occurring through the orchestration of multiple semiotic modes, each offering distinct affordances for meaning-making (Jewitt et al., 2016; Kress, 2010). This framework supports the belief that individuals express and externalize knowledge not only through language but also through visuals, symbols, and spatial design. Multimodal inquiry was thus used to capture a fuller spectrum of participants' conceptions—both explicit and implicit.

### *Participants*

The study sample consisted of 35 pre-service mathematics teachers enrolled in the final year of their undergraduate program at the Faculty of Education at a public university in Turkey. Among the participants, 57% were male and 43% female. All participants were preparing to become middle school mathematics teachers and had completed a year-long school internship as part of their teacher training. Participants had completed two relevant courses prior to this

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


study: Educational Psychology and Mathematics Education for Gifted/Talented Students. While the Educational Psychology course did not include content on giftedness, the latter course introduced various theoretical models of giftedness and talent (e.g., domain-general, domain-specific, system, and developmental models). However, the course predominantly emphasized cognitive attributes and observable classroom behaviors such as learning speed, analytical thinking, and academic creativity. Limited attention was given to affective or socio-emotional traits. Participants had completed this course one term prior to the data collection phase.

### *Procedure*

The data were collected during the spring semester of the 2022–2023 academic year. Prior to data collection, participants were informed of the study's purpose, their rights to voluntary participation, and the confidentiality of their responses. Written informed consent was obtained from all participants.

Each participant received two blank A4 sheets and a set of colored pencils. They were instructed as follows:

"*You have two blank sheets of paper. On the first sheet, please express what you understand by the concept of 'being gifted,' and on the second, your understanding of 'being talented.' You are free to use writing, drawing, symbols, or any combination of these to communicate your thoughts. There are no right or wrong answers–please feel comfortable expressing your ideas in whatever way feels most natural to you"*

The activity was designed to be open-ended in order to encourage the natural expression of both verbal and non-verbal ideas. Participants were given one hour to complete their responses and were encouraged to engage freely with the task. Afterward, participants attended a brief debriefing session, where ethical procedures were reiterated, and questions were addressed.

### *Data Collection*

The primary data collection instrument was a multimodal, semi-structured task designed to elicit participants' conceptions using three primary semiotic modes: written language (LM), visual imagery (VIM), and mathematical symbolism (MSM). This instrument was developed based on the theoretical principles of social semiotics (Kress, 2010) and multimodal text analysis (Baldry & Thibault, 2010). Each mode offers distinct possibilities for expressing knowledge:

- Written Language Mode (LM): Offers explicit, verbalized conceptual understanding.
- Visual Imagery Mode (VIM): Facilitates metaphorical, symbolic, or emotional representation.
- Mathematical Symbolism Mode (MSM): Enables abstract reasoning and disciplinary-specific expression in mathematics and other sciences.

By allowing participants to draw upon these different modes, the instrument provided an opportunity to externalize implicit mental representations and express complex, layered meanings that may not emerge through commonly used verbal data collection methods.

### *Data Analysis*

To examine how pre-service teachers conceptualize the constructs of "being gifted" and "being talented," the participants' written and visual responses were analyzed using a structured approach grounded in multimodal semiotic analysis. This analytical method allows researchers

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


to interpret how meaning is constructed through the combination of multiple communicative modes, including language, images, symbols, and layout. Each participant produced two static multimodal texts–one for "being gifted" and one for "being talented." These texts incorporated three primary semiotic modes: written language (LM), visual imagery (VIM), and mathematical symbolism (MSM). This multimodal design was informed by the framework of Baldry and Thibault (2010), who argued that each mode provides distinct affordances for meaning-making within an externalized conception. Written language tends to convey abstract and analytical thoughts; visual imagery captures metaphorical and emotional ideas; and mathematical or symbolic notations allow for precise, discipline-specific expression. The simultaneous use/orchestration of these modes enabled participants to articulate both explicit and implicit understandings of the target concepts.

To guide the analysis of these complex texts, the study employed a Multimodal Semiotic Analysis Protocol (MSAP), which was developed specifically for this research. The MSAP is based on the principles of Systemic Functional Theory (SFT) (Halliday & Matthiessen, 2014), a linguistic model that views communication as fulfilling three broad and interrelated metafunctions:

1. Ideational Meaning: This aspect of the analysis focused on the content and subject matter of the participants' representations. Specifically, it examined:

- The types of learning skill domains attributed to gifted or talented individuals (e.g., cognitive, affective, psychomotor).
- Observable actions or utterances, such as behaviors, symbols, or language that suggest how gifted or talented individuals might act or perform.
- Associated occupational fields, including careers or domains (e.g., science, music, sports) implied in the representation.

2. Interpersonal Meaning: This dimension explored the attitudes, emotions, and values expressed in the participants' texts. These were categorized as:

- Attitudes: Positive, neutral, or negative orientations toward giftedness or talent.
- Values: The degree of importance attributed to giftedness or talent (significant, neutral, or insignificant).
- Graduation: The intensity or strength of these attitudes and values, which was operationalized by the number of modes used in expressing them (e.g., use of both image and text may reflect stronger emotional investment).

3. Textual Meaning: This metafunction dealt with the structural and compositional aspects of the multimodal texts. It evaluated how well the different semiotic modes (e.g., text and imagery) were integrated, whether the representation was coherent, and whether the design elements supported the intended meanings. It also considered layout, spatial organization, and the interplay between modes.

Although the primary analysis was qualitative, the use of the MSAP enabled researchers to systematically code and categorize the data, which were then summarized using descriptive statistics (frequencies and distributions) to identify patterns across participants (See Table 1). This helped in visualizing the overall trends in how participants conceived of the two constructs.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 1**
*Text Analysis Protocol*

| | | Ideational Meaning | | | Interpersonal Meaning | | | Textual Meaning |
|---|---|---|---|---|---|---|---|---|
| | LM | Learning Skill Domain | Appearance | Occupational field | Feeling | Value | Graduation | Modes |
| Modes | VIM | | | | | | | |
| | MSM | | | | | | | |

*Trustworthiness*

To ensure the reliability and validity of the data analysis tool, a systematic procedure was implemented. The Multimodal Semiotic Analysis Protocol (MSAP) for analyzing functional meanings was developed based on theoretical and empirical research in gifted/talented education and multimodal semiotic analysis mentioned above, establishing the tool's validity. Reliability was tested using intra-rater and inter-rater reliability procedures suggested by Rui and Feldman (2012). For intra-rater reliability, the same researcher analyzed two texts twice, with a one-week interval, to assess consistency. For inter-rater reliability, two experienced researchers independently analyzed the same two texts, comparing their categorical codes for similarity and consistency. Cohen's Kappa test was employed to measure agreement between codes. The reliability scores for both procedures are presented in Table 2.

**Table 2**
*Kappa Results of Intra-rater and Inter-rater Reliability*

| | Ideational Meaning | | | Interpersonal Meaning | | | Textual Meaning |
|---|---|---|---|---|---|---|---|
| **Intra-rater Reliability** | **Learning Skill Domain** | **Appearance** | **Occupational Field** | **Feeling** | **Value** | **Graduation** | **Modes** |
| Text 1 | .775 | .729 | .626 | .715 | .763 | .919 | .875 |
| Text 2 | .759 | .816 | .841 | .875 | .863 | .929 | .915 |
| **Inter-rater Reliability** | | | | | | | |
| Text 1 | .685 | .629 | .676 | .763 | .669 | .836 | .835 |
| Text 2 | .719 | .716 | .741 | .675 | .663 | .843 | .875 |

This study's methodology was designed to enable a deep and multifaceted exploration of pre-service teachers' conceptions of giftedness and talent. By integrating a multimodal data collection instrument, a theoretically grounded analysis framework, and rigorous reliability procedures, the research ensured both conceptual depth and methodological rigor. This approach provided the necessary tools to uncover both the explicit and implicit dimensions of participants' conceptions–laying the foundation for a rich and meaningful interpretation of the findings presented in the next section.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


## Research Results

Of the 35 participants, 33 created multimodal texts to express their conceptions of "being gifted" and "being talented," while 2 created monomodal texts (only language mode). The analysis focused on three areas: (1) characterizations and attributions related to learning skills, utterances, and occupational fields (ideational meaning); (2) teachers' attitudes toward the terms (interpersonal meaning); and (3) the compositional richness of their texts (textual meaning).

*Ideational Meaning*

1. *Attributed Skills*

Figure 1 below shows the attributed learning skill domain for the term "being gifted". 28 participants with LM, and 29 participants with VIM, related "being gifted" with only the cognitive learning skill domain. With LM, 4 participants related the construct with both cognitive and affective learning skill domains. Furthermore, most of the participants deployed the three modes, and the main learning skill domain attributed to "being gifted" is the cognitive learning domain. The psychomotor learning skill domain was not attributed and related to "being gifted". This data shows that the majority of the participants equate "being gifted" with intellectual skills.

**Figure 1**
*Attributed Skills to the "Gifted" Construct in Modes*

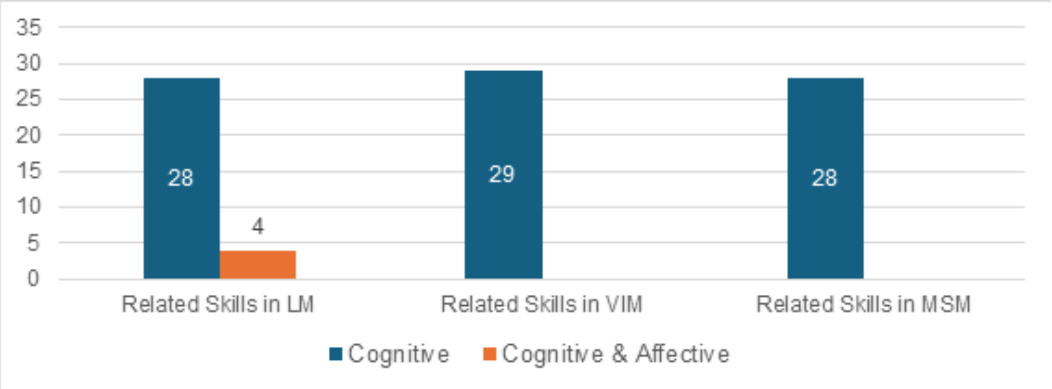
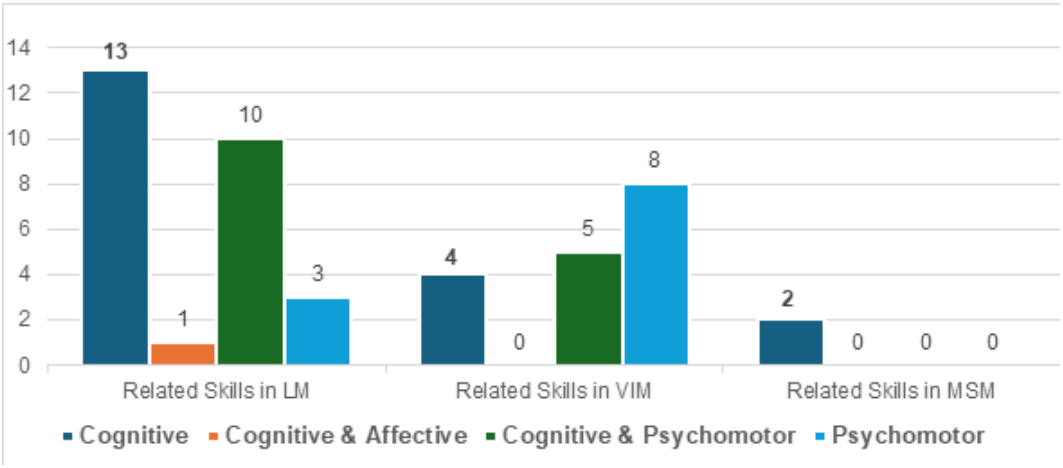



Figure 2 shows different results compared to Figure 1, showing greater variety in the learning skill domains associated with "being talented" and differences in the modes used to construct meaning. For LM, 13 participants associated "being talented" with cognitive and psychomotor skills, 10 with only cognitive skills, 3 with only psychomotor skills, and 1 with cognitive and affective skills. VIM linked "being talented" to cognitive skills for 8 participants, to cognitive and psychomotor skills for 5 participants, and to only cognitive skills for 4 participants. MSM was rarely used, with only 2 participants associating "being talented" with the cognitive learning skill domain. In comparison to "being gifted," which participants primarily associated with cognitive learning skill domains, "being talented" was related to all three domains–cognitive, psychomotor, and affective–with greater emphasis on psychomotor skills. Additionally, MSM was used less frequently to express conceptions of "being talented."

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Figure 2**
*Attributed Skills to the "Talented" Construct in Modes*



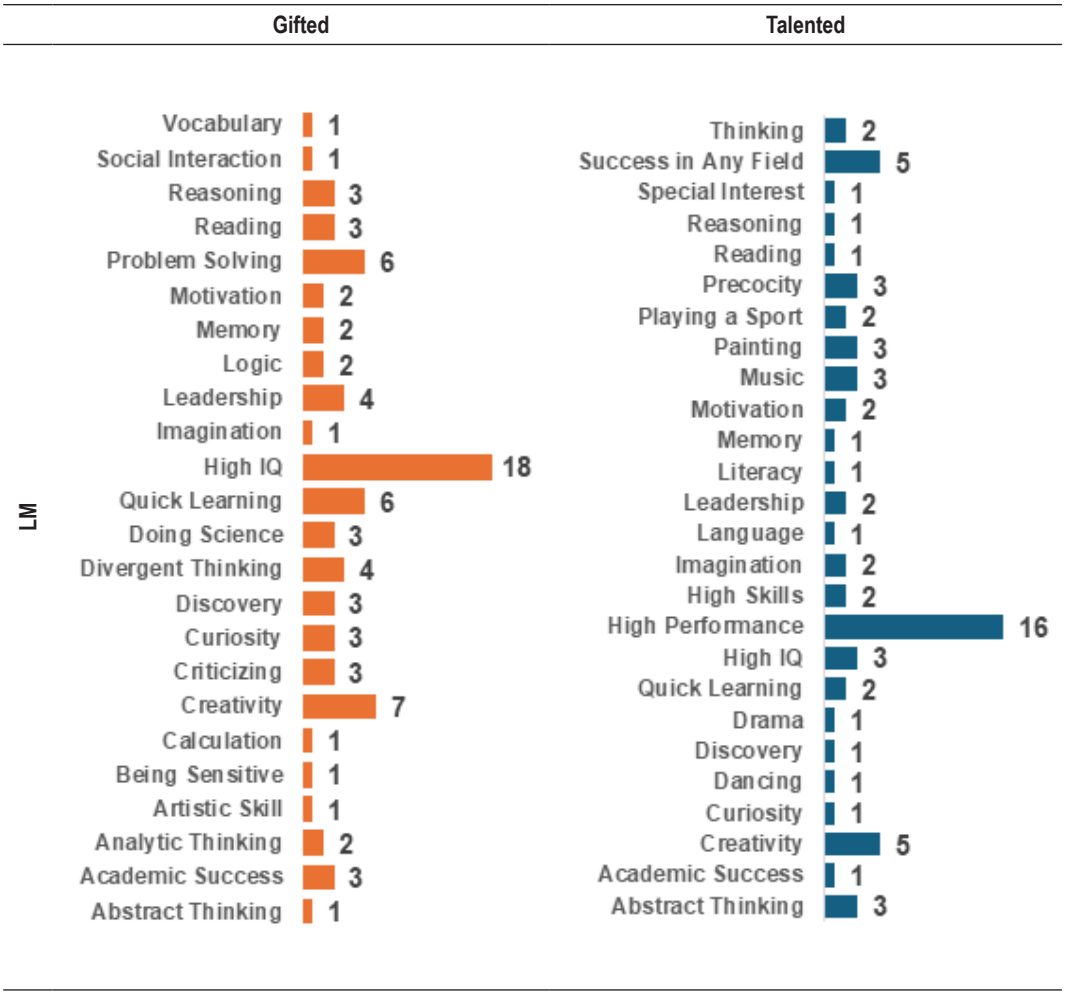

2. *Utterance*

For "being gifted," LM featured the greatest variety of utterances, with "high IQ" (18) as the dominant theme, reflecting a domain-general view equating giftedness with intelligence (See Figure 3). Other frequent utterances included creativity (7), problem-solving (6), high learning speed (6), divergent thinking (4), and academic success (3). In VIM, the most observed portrayals included a "thinking kid" (14), calculating (9), brain structure (6), and a "working brain" (4) (See Figure 4). In MSM, "calculating" (14) and arithmetic (6) were the most common, with calculating linked to solving mathematical or scientific problems and arithmetic referring to basic operations (See Figure 4). Less frequent utterances included discovery, curiosity, reasoning, and reading, while artistic skills and social interactions were rarely mentioned. For "being talented," LM predominantly expressed "high performance" or "success in any field" (16), followed by creativity (5). Other utterances included precocity, playing sports, performing arts, and abstract thinking. In VIM, participants often depicted "playing a musical instrument" (8), "painting" (8), and "playing a sports game" (6), with less frequent references to singing, dancing, or "thinking kid" (3 each). MSM included only two cases of "calculating" attributed to "being talented." In summary, "being gifted" is primarily associated with cognitive abilities such as problem-solving and academic success, while "being talented" is linked to performance in arts or sports. The variety and choice of semiotic resources across modes reveal distinct mental representations of these constructs. This finding contradicts perspectives that view "gifted" and "talented" as interchangeable terms, emphasizing the nuanced differences in how participants internalize and express these concepts. Figure 5 shows the occupational fields attributed to "gifted" and "talented". The data shows that "gifted" and "talented" terms are attributed to different professional fields, in which fields related to science are opted for "gifted" and fields related to arts and sports are generally attributed to "talented.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025



**Figure 3**
*Utterances of "Gifted" and "Talented" Students in LM Mode*

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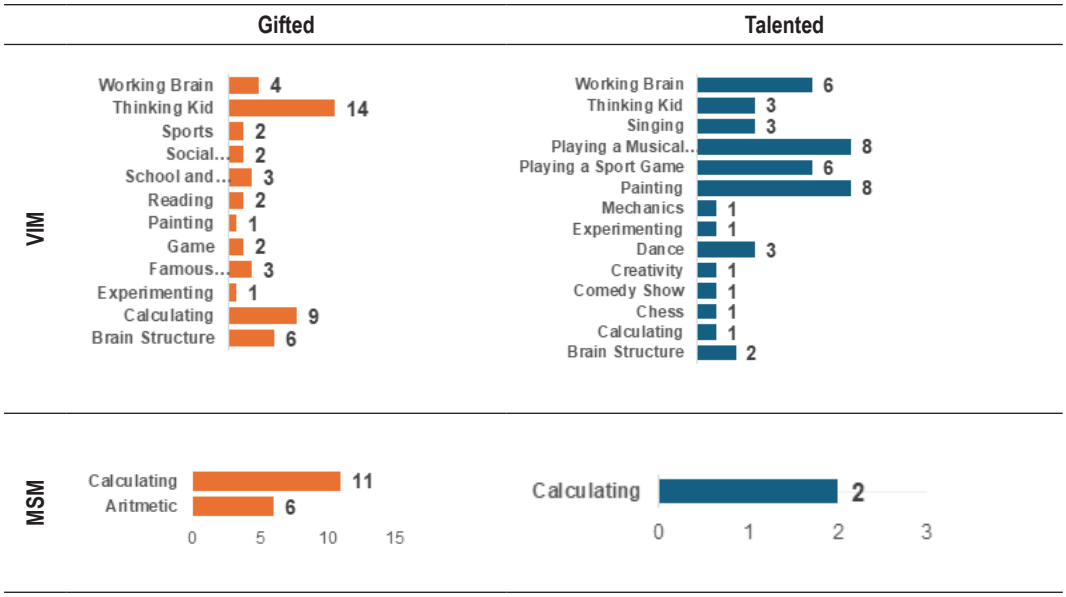
PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Figure 4**
*Utterances of "Gifted" and "Talented" Students in VM and MSM Modes*




Participants generally depicted the positive aspects of being gifted and talented (See Table 3). Therefore, they generally embrace positive feelings and values toward being gifted and talented. The use of multiple modes in the expression of attitudes refers to the feeling or given value being expressed, for example, through LM and VIM. These findings imply that multimodal expression of conceptions enables not only the content (ideational meaning) but also the attitudes toward the circumstance under question.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Figure 5**
*Associated Occupational Fields to "Being Gifted" and "Being Talented" in Modes*

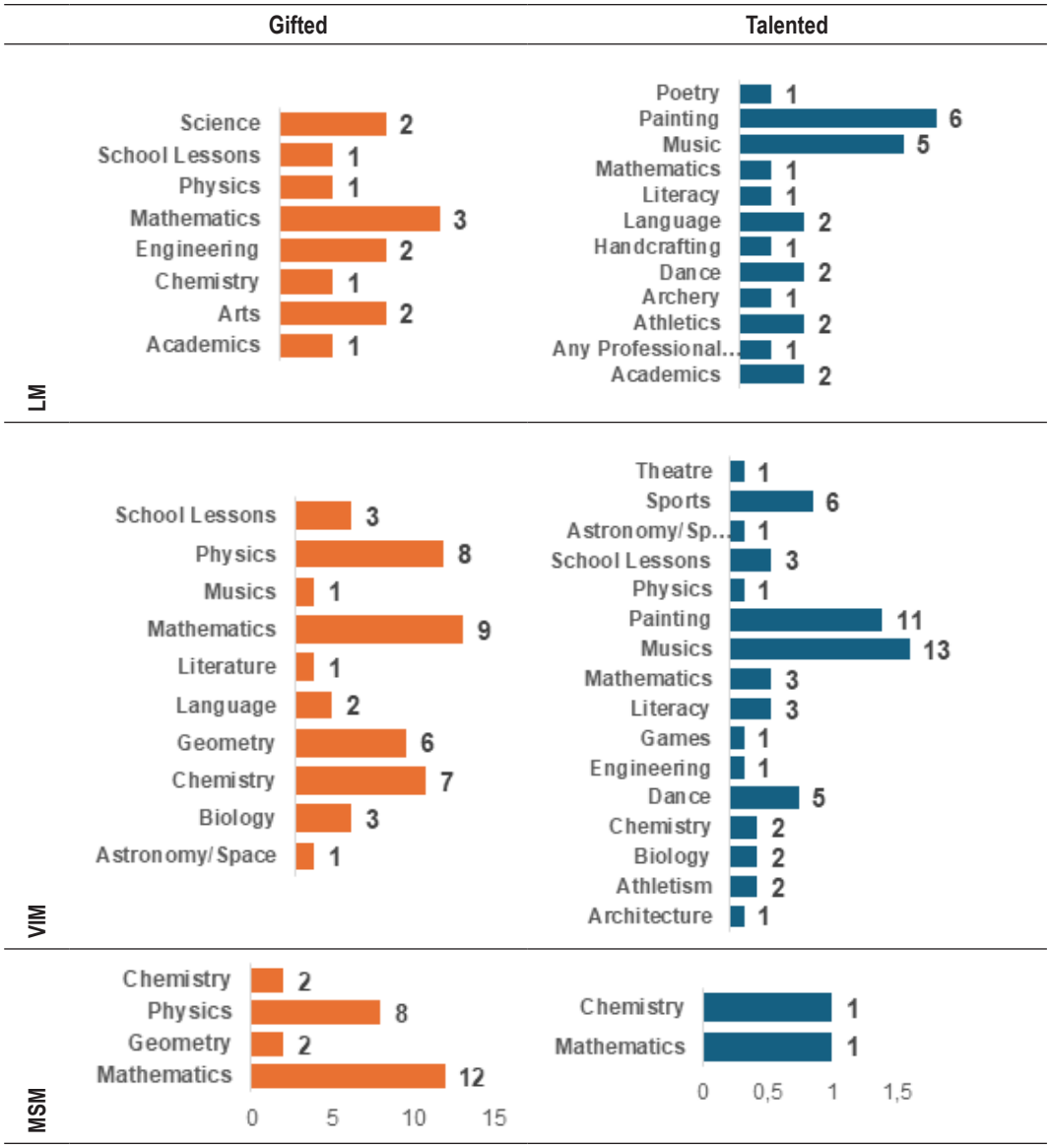



**Table 3**
*Attitudes of Participants Toward "Being Gifted" and "Being Talented"*

| | Feeling | | | Values | | | Graduation | | |
|---|---|---|---|---|---|---|---|---|---|
| | Positive | Neutral | Negative | Significant | Neutral | Insignificant | 1M | 2M | 3M |
| **Gifted** | 28 | 6 | 1 | 28 | 7 | - | 4 | 15 | 16 |
| **Talented** | 31 | 4 | 0 | 27 | 8 | - | 6 | 28 | 1 |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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025

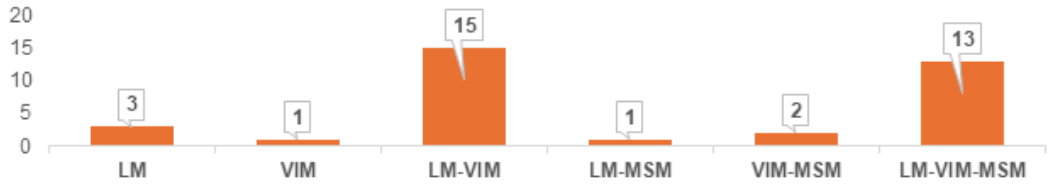

*Textual Meaning*

Figures 6 and 7 below demonstrate which modal or compositional choices are made for the expression of views about gifted and talent constructs. This is the semiotic features and structures of the texts and how the semiotic choices are deployed and used for their expressions of the concepts under question.

1. *Use of Modes/ Mode Structure in the Expressions*

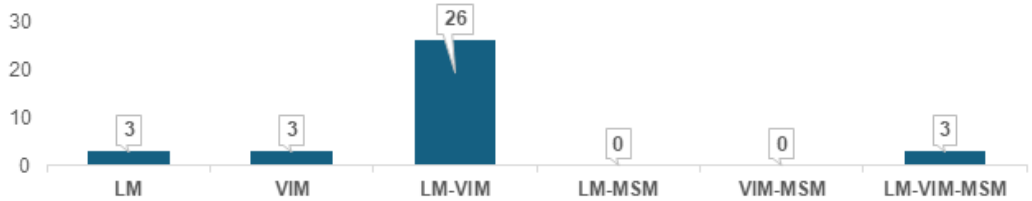
Figure 7 displays that the most common mode structure is LM and VIM. Secondly, almost half of the participants deployed the tree modes to express their conceptions of "being gifted" and "being talented". Only two participants expressed their conceptions through monomodal texts. Participants used the affordances and functionalities of various semiotic resources and modes to realize and materialize their conceptions of "being gifted" and "being talented".

**Figure 6**
*Mode Structures of Texts Expressing "Being Gifted"*




Similarly, Figure 8 shows that the majority of participants recruited multimodal semiotic choices for the expression of conceptions of "being gifted" and "being talented". But the most observed difference is the number of deployed modes. Since cognitive skills are less related to "being talented", the use of MSM is scarce. The mostly observed text structure is multimodal but engaging LM and VIM. This situation demonstrates that they use diverse types of semiotic resources to make meaning of questioned terms, and the variety in the deployment of these semiotic resources implies that multimodal expression facilitates them to externalize their mental images better than a monomodal expression, such as interviewing.

**Figure 7**
*Mode Structures of Texts Expressing "Being Talented"*




*An Exemplary Case of Expressions about Being Gifted and Being Talented*

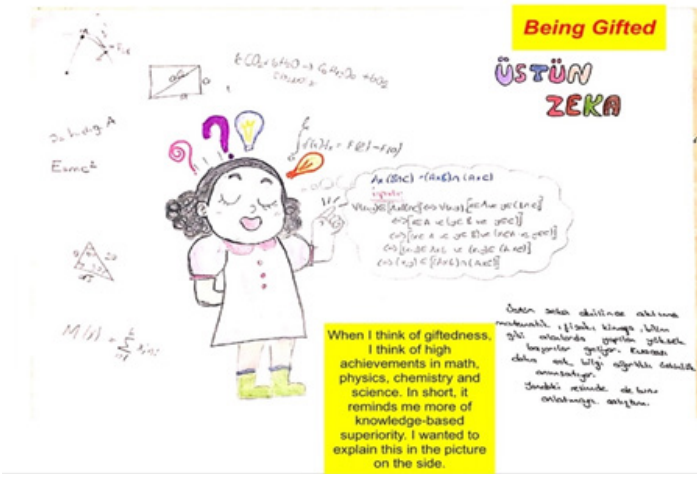
In this section, we present one exemplary case of expressions and how the conception or mental image is externalized through the multimodal selection of semiotic resources.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


There is one selection criterion, which is that texts are expected to be multimodal. Among the multimodal expressions, texts are randomly selected. Figure 8 illustrates a participant's conception of "being gifted" through written language (LM), visual imagery (VIM), and mathematical symbolism (MSM). The ideational meaning emphasizes cognitive abilities across all three modes. In LM, "thinking" is highlighted as a core attribute, while VIM depicts a "thinking child" generating ideas and solving problems. MSM reinforces these attributes with mathematical formulas and calculations, collectively linking "being gifted" to academic success and problem-solving. The occupational fields associated with "being gifted" include Mathematics, Physics, Chemistry, and Science. These fields are explicitly named in LM, visually depicted in VIM, and symbolically represented in MSM, showcasing a strong association between giftedness and scientific disciplines. The interpersonal meaning reflects a positive attitude, portraying giftedness as essential for success in academics and science. LM highlights achievements, VIM illustrates problem-solving through a "thinking child," and MSM conveys these ideas through mathematical actions. The participant's consistent use of all three modes underscores the importance of giftedness. The compositional aspect integrates LM, VIM, and MSM effectively, with color and detailed imagery enhancing the representation. Table 4, using the Multimodal Semiotic Analysis Protocol (MSAP), highlights the participant's skillful use of multimodal resources to convey their conception of "being gifted."

The text in Figure 9 illustrates the conception of "being talented" of the same participant. The text is comprised of various semiotic resources within LM and VIM to realize ideational, interpersonal, and textual meanings. Regarding the ideational meaning, LM involves elements showing high performance and success, and VIM involves elements showing painting and playing a musical instrument, which requires cognitive and psychomotor abilities. The occupational fields shown in LM are arts branches such as painting and music, and music and painting in VIM. No semiotic resources in MSM are deployed. To realize the interpersonal meaning, the participant used LM and VIM elements. The feeling is shown through elements such as "talent is a good thing to achieve or high performance", which are positive. Regarding the importance, "being talented" is viewed as significant for achieving high performance, such as in music and painting. The attitude is both graded in LM and VIM. The text is multimodal, involving LM and VIM. The main difference with the text showing "being gifted" is the absence of MSM. The filled state of the MSAP regarding this participant's text, in which the conception of "being talented" is expressed, is given in Table 5.

**Figure 8**
*A Text Designed by a Participant to Express "Being Gifted"*

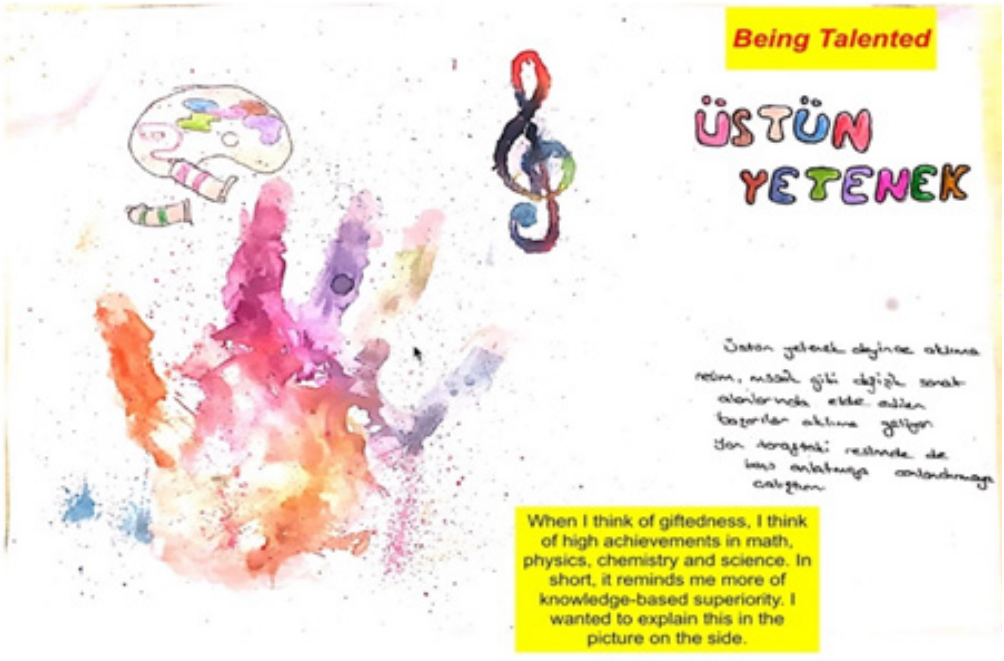

Being Gifted
ÜSTÜN
ZEKA
When I think of giftedness, I think of high achievements in math, physics, chemistry and science. In short, it reminds me more of knowledge-based superiority. I wanted to explain this in the picture on the side.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 4**
*The Filled MSAP for Expression of "Being Gifted"*

| Learning Skill Domain | | Ideational Meaning | | | Interpersonal Meaning | | Textual Meaning | |
|---|---|---|---|---|---|---|---|---|
| | | Appearance | Occupational Field | Feel-ing | Value | Graduation | Modes | |
| Modes | LM | Cognitive | Knowing many science fields. | An occupation in the fields of Mathematics, Physics, and Chemistry. | Positive | Significant. "Being gifted" was seen as a significant factor in doing the depicted actions. | 3 Modes. The value is expressed in three different modes. | LM VIM MSM |
| | VIM | Cognitive | A thinking kid with closed eyes. The thinking action includes creating and calculating. | - | | | | |
| | MSM | Cognitive | The thinking action includes creating. | An occupation in the fields of Mathematics, Physics, and Chemistry. | | | | |

**Figure 9**
*A Text Designed by a Participant to Express "Being Talented"*


Being Talented
ÜSTÜN
YETENEK
When I think of giftedness, I think of high achievements in math, physics, chemistry and science. In short, it reminds me more of knowledge-based superiority. I wanted to explain this in the picture on the side.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 5**
*The Filled MSAP for Expression of "Being Talented"*

| | Learning Skill Domain | Ideational Meaning | | | Interpersonal Meaning | | | Textual Meaning |
|---|---|---|---|---|---|---|---|---|
| | | Appearance | Occupational Field | Feeling | Value | Gradu-ation | Modes | |
| Modes | **LM** | Cognitive and psycho-motor | Painting Playing | An occupation in the fields of Music and Painting | Positive | Significant. "Being gifted" was seen as a significant factor in doing the depicted actions. | 2 Modes. The value is expressed in two different modes. | LM VIM |
| | **VIM** | Psycho-motor | Painting Playing | An occupation in the fields of Music and Painting | | | | |
| | **MSM** | | | | | | | |

Overall, the findings reveal that pre-service teachers' conceptions of "being gifted" and "being talented" are shaped by both scientifically informed models and culturally persistent stereotypes. While participants demonstrated a general awareness of cognitive and performance-based distinctions, their conceptualizations often relied on static traits and overlooked the developmental processes underpinning talent emergence. Notably, emotional and psychological characteristics were frequently attributed to giftedness, reflecting broader social narratives.

## Discussion

Teachers' conceptions of gifted and talented students are shaped by a confluence of pedagogical beliefs, cultural narratives, and the nature of their professional preparation. These conceptions play a pivotal role in how giftedness is identified and how instructional support is structured (Golle et al., 2023; Reis-Jorge et al., 2021). The current study explored how pre-service mathematics teachers conceptualized "being gifted" and "being talented" within the framework of DMGT) (Gagné, 2013), which distinguishes innate aptitudes (gifts) from systematically cultivated competencies (talents). Although participants were introduced to giftedness theories and talent development through coursework, their responses revealed persistent misconceptions—particularly a tendency to equate giftedness with static cognitive traits (e.g., high IQ, creativity) and talent with excellence in performance areas like music, sports, or mathematics. This oversimplification reflects earlier findings that teachers often rely on lay beliefs and media stereotypes rather than nuanced developmental models.

Importantly, this study did more than identify the content of participants' conceptions; it also innovated in how these conceptions were captured and analyzed. Much of the existing literature on teacher beliefs about giftedness relies on interviews, surveys, or metaphor analysis—methods that privilege linguistic forms of expression and may not fully access participants' implicit knowledge. In contrast, this study employed a multimodal semiotic approach to data collection and analysis, allowing participants to express their mental representations using various semiotic resources, including drawings, symbols, spatial arrangements, and language. Grounded in representational redescription theory (Karmiloff-Smith, 1992) and multimodal discourse analysis (Baldry & Thibault, 2010; Jewitt et al., 2016), this method successfully uncovered both explicit (verbalized) and implicit (non-verbalized or symbolic) layers of teacher

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025



conceptions. Participants' visual and multimodal productions frequently revealed nuanced associations, emotional attitudes, and conceptual distinctions that were not fully articulated in their written or spoken responses. This approach proved especially useful in exploring abstract constructs like giftedness and talent, as it allowed a richer view into how future teachers mentally organize, prioritize, and connect these ideas.

Despite the previous trainings, participants often failed to recognize the dynamic developmental processes that transform giftedness into talent. Most treated giftedness and talent as static traits or dichotomous identities, rather than seeing talent as an emergent outcome of sustained development. Furthermore, few participants acknowledged the multidimensional domains outlined in the DMGT model—such as socio-affective or sensorimotor domains—focusing instead on high academic performance or cognitive ability. This suggests a persistent gap between theoretical models and teacher reasoning, raising concerns about the effectiveness of current teacher education in fostering accurate and applied understandings of talent development (Subotnik et al., 2011).

Participants also interpreted giftedness through a strong lens of non-cognitive traits. Many emphasized positive attributes like curiosity, independence, and motivation, but they frequently paired these with traits such as anxiety, introversion, or perfectionism. These characteristics were often portrayed as defining features of gifted individuals, echoing the culturally entrenched stereotype of the "mad genius" (Baudson, 2016). Yet recent large-scale reviews call this stereotype into question. For example, Tourreix et al. (2024) found that gifted students, on average, are not more psychologically vulnerable than their non-gifted peers; in many cases, they display equal or greater well-being (Francis et al., 2016). Thus, while some participants identified emotional complexity, they often framed it as an intrinsic cost of giftedness rather than a possible byproduct of environmental mismatches.

To further interpret these misconceptions and propose corrective frameworks, this study explains this situation, referring to novel talent development theories such as Merello's (2024) Non-Orthogonal Multidimensional Theory (NOMT). As a synthesis and expansion of existing models, NOMT offers a more dynamic view of talent development—one that emphasizes the transformation of genesis-based aptitudes (giftedness) into observable outcomes through four interdependent tools: cognitive profile, psychosocial skills, non-cognitive traits, and contextual conditions. The model culminates in three interconnected developmental products: domain-specific performance, psychological balance, and social contribution. By reframing giftedness and talent not as fixed traits but as evolving, co-constructed outcomes, NOMT helps explain why misconceptions persist even after formal coursework: teachers are often introduced to definitions without being shown how development actually unfolds over time, across environments, and in response to diverse internal and external influences. Moreover, NOMT may provide a valuable framework for teacher training itself. The findings of this study suggest that beliefs about giftedness function not only diagnostically–shaping who gets identified–but normatively, reinforcing narrow ideals of what giftedness "should" look like. Participants often overlooked or misclassified students whose abilities or traits did not align with these static ideals. To counteract this, this paper recommends that teacher education programs incorporate dynamic, systemic models like NOMT, alongside multimodal expression opportunities that support deeper conceptual integration. Importantly, theory must be paired with practice. Pre-service teachers should be given structured, guided opportunities to engage with gifted learners in real or simulated contexts, allowing them to observe and interpret development as a fluid, context-sensitive process rather than a fixed category. Only through this integration of comprehensive theory, reflective practice, and multimodal expression can teacher beliefs begin to shift toward a more inclusive and accurate understanding of giftedness and talent.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


## Conclusions and Implications

This study contributed to the growing field of gifted education by examining how teachers conceptualize "being gifted" and "being talented," both in content and expression, using a multimodal semiotic approach. The findings revealed that, despite exposure to theoretical models like Gagné's (2013) DMGT, participants frequently maintained simplified, essentialist understandings–equating giftedness with static cognitive traits (e.g., high IQ, creativity) and talent with visible performance outcomes as an unrelated concept to giftedness. While participants demonstrated generally positive attitudes toward gifted learners, their mental representations often failed to capture the dynamic, developmental nature of talent formation emphasized in models like DMGT. This framework was particularly valuable in interpreting why such misconceptions persist: teacher beliefs are often shaped not just by theoretical exposure, but by limited practical experience and a lack of integrative, developmental models that emphasize the transformation of innate potential (genesis) through psychosocial, cognitive, and contextual interactions over time.

Critically, the use of a multimodal semiotic data collection and analysis strategy allowed this study to access both explicit and implicit layers of participants' conceptions–something traditional interviews or surveys may not fully reveal. This methodological innovation offered richer, more nuanced insights into how pre-service teachers visualize and internalize constructs of giftedness and talent, highlighting the potential of multimodal tools for teacher education and research alike.

The implications for teacher education are both conceptual and practical. First, training must move beyond static definitions and equip future educators with developmental perspectives that treat talent as a trajectory rather than a fixed label. Models like NOMT, which link cognitive potential with psychological balance and social contribution, provide an integrative lens that can clarify the distinction and interdependence between giftedness and talent. Second, trainings, based on theoretical knowledge alone, are insufficient. Teachers must engage in experiential learning contexts–observing or working with diverse learners–where they can apply these frameworks to real developmental trajectories and interpret variability as part of the talent emergence process.

### *Limitations*

Several limitations should be acknowledged in interpreting the findings of this study. First, the sample size was limited and comprised exclusively of pre-service mathematics teachers, which may restrict the generalizability of the results. Participants' disciplinary backgrounds may have influenced their conceptualizations, particularly in terms of favoring cognitively oriented or mathematically inclined abilities and career trajectories when discussing giftedness and talent. Future studies including pre-service teachers from diverse subject areas may reveal broader or contrasting perspectives. Second, participants had previously completed coursework related to gifted and talented education, but the depth, content, and instructional quality of that course were not systematically examined. As a result, variations in prior knowledge may have shaped participants' responses in ways that this study could not fully control or account for. More comprehensive evaluations of teacher education curricula–including exposure to theoretical models, practical strategies, and real-life classroom experiences with gifted learners–would help contextualize and extend the current findings.

## Notes

Some parts of the findings in this study were previously presented at the 17th Asia-Pacific Conference on Giftedness, held in Taipei, Taiwan, from July 7 to 10, 2022.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025
176

# EFFECT OF BEHAVIOR CONTRACTS ON REDUCING PROBLEM BEHAVIORS AND ENHANCING ACADEMIC ENGAGEMENT IN GENERAL CLASSROOM SETTINGS

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## Abstract

*Many students in schools may demonstrate problem behaviors and show signs of academic disengagement behaviors in schools, especially students who are educated in upper-secondary schools. Exhibition of problem behaviors may negatively affect students' academic performance. These students need to receive effective interventions, such as behavioral contract interventions, to help them behave and learn well. This study aimed to examine the effect of employing behavioral contract interventions in the reduction of problem behaviors and the enhancement of academic engagement in four upper-secondary students who exhibit problem behaviors and show signs of academic disengagement behaviors in general classroom settings. The single-subject research with ABAB design was used as an experimental method to examine the effect of behavioral contract intervention for the four upper-secondary students. All four upper-secondary school students were male students. These students were observed during the study by daily progress reports as a data collection tool by two observers. The results of the study displayed a positive effect on the four upper-secondary students using behavioral contract intervention. All the students had high levels of reducing problem behaviors and increasing academic engagement behaviors. The study found that the behavioral contract intervention was a useful intervention for all the students. These findings indicated that the behavioral contract intervention can be added as part of the school's policy to reduce students' problem behaviors and enhance academic engagement behaviors. Also, the intervention may need to be replicated with another gender, such as female students.*

**Keywords**: *academic engagement, contingency contracting, problem behavior, students with behavior issues, school settings*

## Introduction

Students who struggle with behavioral issues often experience academic difficulties, as their disruptive behaviors hinder focus and participation. Problem behaviors, including physical behaviors, such as fighting with others, pushing their peers, and pushing, can negatively affect students' academic behavior and relationships with their peers (Owman-Perrott et al., 2015). In the absence of appropriate intervention, these students risk academic disengagement behaviors, leading to further challenges in both school and future work environments. Students with problem behaviors may also injure themselves or others. They may exhibit such behavior to avoid performing undesirable tasks and escape attendance requirements. Students who exhibit problem behaviors need to get effective interventions, such as a behavior contract intervention, to address their problem behaviors.

Owman-Perrott et al. (2015) emphasized the importance of structured behavioral interventions in reducing disruptive behaviors and fostering academic engagement. Behavior contracts, in particular, have been shown to help students transition from exhibiting problem

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


behaviors to demonstrating appropriate academic conduct. These contracts outline clear expectations and reinforcements, allowing students to make informed behavioral choices. Also, behavioral contract interventions offer a structured approach to address behavioral issues. These contracts involve goal setting, reinforcement strategies, self-monitoring techniques, and providing students with a feeling of control over their acts.

Hawkins et al. (2011) indicated that behavior contracts can be considered effective interventions in modifying problematic behaviors and enhancing academic engagement behaviors for students with autism. For this intervention, teachers need to meet each student required to address his or her behavioral issues, discuss all the aspects of their problems, and choose positive reinforcements. These contracts outline clear expectations and reinforcements, allowing students to make informed behavioral choices. These teachers are trained to manage students with such behavioral problems and turn them into active students. Problematic behaviors and academic disengagement behaviors can extend from the educational environment to the work environment if students with such behaviors receive no intervention. So, students who display problem behaviors and behaviors related to academic disengagement may need to receive effective interventions, such as behavior contract interventions.

Kirk and Rifkin (2020) and Abraham et al. (2020) defined behavior contract interventions as written agreements between teachers or counselors and students that outline specific behavioral expectations. These contracts detail the behaviors students are expected to demonstrate, such as following teacher instructions, completing assignments, sitting appropriately, and showing respect toward peers and teachers. Moreover, behavior contracts help reduce problematic behaviors, such as hitting, throwing objects, and disregarding instructions. Owman-Perrott et al. (2015) further emphasized that behavior contracts foster collaboration between teachers and students, promoting a structured and supportive learning environment.

Behavior refers to an individual's actions and responses in various situations. It can be classified into different categories, such as verbal behaviors (e.g., speaking and responding) and physical behaviors, such as movement, off-task actions, and improper social interactions with others. According to Putri and Sulthoni (2022), behavior encompasses all actions resulting from an individual's interactions with themselves or others.

Olivier et al. (2020) defined problem behaviors as actions that can be categorized into externalizing and internalizing behaviors. Externalizing behaviors include disruptive and aggressive actions such as physical aggression, property destruction, anger outbursts, and off-task behaviors. By contrast, internalizing behaviors, on the other hand, involve emotional and social withdrawal, anxiety, and difficulties in interpersonal interactions.

Academic engagement behaviors refer to students' conduct in school settings that contribute to their learning success. These include following instructions, completing assignments and homework, participating in discussions, answering questions after getting the teacher's permission, adhering to classroom expectations, and bringing necessary materials to class. Musa (2020) highlights that positive academic behaviors enhance students' self-efficacy, confidence, and readiness to learn.

In the literature review, research on school violence has focused on strategies to mitigate aggressive behaviors, such as fighting, kicking, hitting, and verbal altercations. These behaviors may hamper learning and lead to interpersonal problems for the participants, even if the behaviors are not always openly violent. Furthermore, although extreme violence in schools is rare, unchecked minor aggressive behaviors can escalate, leading to a school climate where violence becomes normalized (Wilson et al., 2003).

Additionally, numerous school-based treatment programs are developed to address aggressive behaviors in schools. Durlak and Wells (1998) conducted meta-analyses of preventive mental health programs, incorporating school-based initiatives designed to improve students' social skills. Similarly, Stage and Quiroz (1997) analyzed the effectiveness of interventions

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025



targeting disruptive classroom behaviors, while Dupaul and Eckert (1997) examined school-based strategies for students with attention deficit disorders. These studies consistently found that certain interventions effectively reduce aggressive behaviors and improve classroom conduct (Wilson et al., 2003).

Daily Behavior Report Cards (DBRCs) have been identified as a valuable tool for addressing aggressive behavior in students. Chafouleas et al. (2006) reviewed prior studies on DBRC implementation and found that it serves as both a behavior-monitoring tool and an intervention component. DBRCs typically include clear behavioral expectations, a rating system (often used daily), and structured feedback shared with students, parents, and teachers. The primary goals of DBRCs range from improving academic performance to fostering positive behavioral changes (Chafouleas et al., 2006).

McDougal et al. (2005) on another intervention strategy aimed at addressing behavioral challenges in elementary school classrooms. Their study explored the effectiveness of a behavioral consultation team, a structured intervention model involving behavioral assessments, positive behavioral support strategies, continuous progress monitoring, and program evaluation. Findings revealed that behavioral consultation intervention was successful in resolving behavioral concerns in 75% of cases. Furthermore, the researchers found that the intervention was acceptable and the integrity of the intervention implementation (McDougal et al., 2005).

Mruzek et al. (2007) explored the use of contingency contracts to recover adherence to behavioral expectations in an elementary school setting. Their study focused on two male students: a 10-year-old identified with autism spectrum disorder and a nine-year-old with attention deficit hyperactivity disorder and suspected Asperger's disorder. Before the intervention, both students frequently exhibited challenging behaviors, including threats, vocal outbursts, and physical aggression.

To address these issues, teachers collaborated with the students to develop written behavior contracts, which were revised multiple times as the students progressed. In the final stages of the intervention, self-monitoring techniques were incorporated into the contracts, and a changing criterion model was applied to examine the success of the approach. The results demonstrated that contingency contracts were successful in modifying the students' aggressive behaviors. This study suggests that such contracts can be a useful tool in reducing aggressive actions such as kicking and hitting (Mruzek et al., 2007).

In a broader attempt to identify effective classroom behavior administration strategies, Oliver et al. (2011) did a systematic review of multi-component, school-wide classroom management practices. Their research aimed to assess the effect of these strategies on minimizing disruptive, aggressive, and problem behaviors among students. The study focused on students from kindergarten through 12th grade in various countries with different educational structures. The participants, aged between 5 and 18 years, were observed in public and special education schoolrooms (Oliver et al., 2011). Teachers implemented classroom management practices designed to reduce problematic student behaviors. An in-depth coding protocol and screening sheet were designed to determine the legibility of studies for incorporation into the analysis. Thereafter, the teachers conducted a detailed review of the literature and identified potential studies for inclusion (Oliver et al., 2011).

Findings from the study revealed that comprehensive, multi-component classroom management initiatives significantly reduced aggressive behaviors. Across 12 studies, students in intervention classrooms displayed fewer disruptive and inappropriate behaviors compared to those in control classrooms, where only standard classroom management techniques were applied. These results suggest that educators who implemented universal class management strategies can expect notable improvements in student behavior, creating an environment conducive to effective instruction (Oliver et al., 2011).

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Similarly, Sheridan and Deering (2011) examined the effectiveness of residential-based behavioral interventions for a boy with a record of trauma and behavioral issues. The study presented two distinct interventions within a behavior support plan created for a 12-year-old who experienced intense abuse and neglect before being placed in state care. One intervention involved a combination of a token economy and a contingency contracting plus response costs. Results showed that the frequency of problematic behaviors decreased to zero over time. Additionally, a separate intervention targeting personal hygiene led to 100% compliance with daily hygiene tasks (Sheridan & Deering, 2011).

Teachers are considered to play a crucial role in managing classroom behavior effectively. To successfully modify or regulate students' behaviors, educators must establish clear intervention objectives and anticipate potential outcomes. Battalio et al. (2013) examined the experiences of secondary school teachers who teach students who have disabilities. The study required participants to determine the frequency of their behavioral interventions, the strategies they employed, and their perceptions of the effectiveness of these techniques. Four key findings emerged from the collected data, highlighting the effect of teacher-led interventions in addressing challenging student behaviors.

First, teachers tend to respond to behavioral problems that overlap with the instruction of others. Second, they intervene when behaviors become intolerable in a group environment. Third, teachers have less potential to address behaviors they perceive as distractions only to the individual student, as long as they do not pose a challenge to classroom management. Finally, teachers generally prefer strategies that do not require involvement from individuals outside the classroom. From their survey, Battalio et al. (2013) educators' approaches to managing student behavior were either reactive or proactive. While reactive strategies may be necessary in critical situations to prevent escalation, students need more than reactive measures to succeed in secondary schools. This finding highlights the fine line between effective decision-making and missed opportunities for intervention (Battalio et al., 2013).

More recent studies explored the effect of behavioral contract interventions in the enhancement of student behavior and academic performance. Sidiq et al. (2020) conducted a repeated-measures study to compare two behavioral counseling techniques (behavioral contracts & token economies) among 16 junior upper-secondary school students with academic procrastination issues. The students were separated into two experimental groups: one received behavioral counseling with a behavioral contract, whereas the other received counseling with a token economy technique. The findings unveiled that both interventions were positive in reducing academic procrastination. However, students in the behavioral contract group demonstrated a greater reduction in procrastination. The study suggested that behavioral contracts provide clear commitments, consequences, and accountability.

Similarly, Sari and Ayriza (2021) explored the effect of the used group counseling combined with behavioral contracts on students' academic procrastination. Their research, based on a research and development (R&D) model, found that students who participated in group counseling with behavioral contracts exhibited significant improvements in their academic engagement behaviors, such as completing homework and assignments. Both Sari and Ayriza (2021) and Sidiq et al. (2020) concluded that behavioral contracts, particularly when combined with intensive group counseling, are effective in addressing academic procrastination.

Devi et al. (2021) also explored behavioral contract interventions using a pretest-posttest design among kindergarten students. Their study aimed to assess the effectiveness of behavioral contracts in promoting discipline, both academically and non-academically. The results indicated a marked improvement in students' classroom discipline following the intervention, highlighting its positive effect on young learners.

Beyond academic performance, behavioral contracts have also been shown to enhance psychological resilience. Tarihoran et al. (2020) conducted a quasi-experimental study on

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025



students of early childhood teacher education, evaluating the effects of behavioral contract counseling on their psychological strength. After the intervention, all students demonstrated increased self-regulation, emotional control, independence, responsibility, and the ability to manage their thoughts. These improvements contributed to their academic success and overall well-being.

Another study by Yusuf et al. (2017) examined the effectiveness of behavioral contract interventions employing a multiple-baseline cross-variable design with elementary-level students diagnosed with ADHD. Before the intervention, the students displayed maladaptive behaviors such as verbal and nonverbal disruptions, interrupting teachers, and moving and speaking without permission. The results showed that behavioral contracts effectively reduced these maladaptive behaviors, helping students exhibit more appropriate classroom conduct.

Sari et al. (2022) used a single-subject A-B-A design to analyze the effect of behavioral contracts on three upper-secondary school students with disruptive behaviors, such as kicking chairs and tables or speaking without permission during lessons. The intervention successfully reduced these disruptive behaviors, leading to better classroom behavior and engagement during learning activities. Finally, Shenoy et al. (2024) also support the use of behavioral contracts as an intensive intervention in Tier 2 behavioral support frameworks. They emphasize the flexibility of behavioral contracts, which allow teachers, school counselors, parents, and specialists to collaborate as interventionists in supporting students' behavioral development.

Camacho et al. (2024) argued that out-of-school suspension is not an effective approach for addressing students with behavioral challenges. This method is often used as a punitive measure rather than a solution to problem behaviors. By contrast, behavioral contract interventions have been identified as an effective technique for reducing disruptive behaviors and improving academic performance (Camacho et al., 2024). These interventions could be incorporated into school policies as a structured approach to support students struggling with behavior management. Schools should provide appropriate educational environments that address the needs of their students, particularly those who show problem behaviors (Camacho et al., 2024). Similarly, Alhossein (2021) highlighted behavioral contract interventions as an evidence-based intervention for improving both academic and non-academic behaviors. While these interventions have been widely implemented in various educational settings, their use in Saudi Arabia remains limited. Alhossein (2021) found that few studies have investigated the effect of behavioral contracts in Saudi Arabian schools, especially for students who are diagnosed with emotional and behavioral disorders. Based on the study's literature review results, the gap of previous studies was determined as seen in the following section.

### *Research Problem*

Various researchers (e.g., Alwahbi, 2020; Tarihoran et al., 2020) have studied the effect of behavioral contract interventions, particularly among students, both with and without disabilities, in elementary and middle schools. These research studies have supported the success of behavioral contracts in enhancing student behavior. However, there is a notable gap in the reviewed studies focusing on upper-secondary school students, particularly in Saudi Arabia. Additionally, existing studies have explored various strategies to reduce problematic behaviors, such as aggression or classroom disruptions, and most have primarily focused on adolescents. Numerous studies (e.g., Chafouleas et al., 2006; Mruzek et al., 2007; Sidiq et al., 2020) have emphasized that contingency contracting can effectively modify student behavior and promote positive conduct.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


### *Research Aim and Research Questions*

The literature strongly supports using a behavioral contract intervention for reducing problematic behaviors and fostering appropriate classroom conduct. Moreover, behavioral contract interventions have proven beneficial in academic disengagement and improving student motivation. However, there is a lack of practical studies on using behavioral contracts in general education settings, particularly for upper-secondary school students with behavioral challenges. This study's purpose was to examine how behavioral contracts can help students with behavioral challenges by using behavioral contract interventions to enhance students' academic engagement behaviors and reduce their problem behaviors. In the following, the study question that the study aimed to answer by using an experimental design is:

• What is the effect of behavioral contracts in reducing problem behaviors and enhancing academic engagement behaviors among upper-secondary students in general classroom settings?

## Research Methodology

### *General Background*

In this study, many studies have been reviewed (e.g., Alwahbi, 2020; Chafouleas et al., 2006; Tarihoran et al., 2020; Sidiq et al., 2020) that indicated behavioral contact interventions were a practical intervention for addressing problem behaviors in students. However, A gap in the existing literature exists regarding focusing on upper-secondary students, especially in Saudi Arabia. For this study, a single-subject approach was adopted to examine the behavioral contract intervention on four upper-secondary school students in Saudi Arabia. The single-subject design was utilized to explore the effect of behavioral contract intervention on how the intervention can help reduce upper-secondary students' problem behaviors and enhance their behaviors related to academic engagement. This study utilized an experimental single-subject design to test the effect of behavioral contract intervention for upper-secondary school students exhibiting problem behaviors and academic disengagement. The design followed an A-B-A-B withdrawal structure. The design was structured around six phases: two phases for baseline measurement, two phases for intervention, one phase for generalization, and one for maintenance. This design allows for the observation of students before, during, and after the intervention, as well as the withdrawal, generalization, and maintenance phases. This ensures a comprehensive evaluation of the effect of behavioral contract intervention on individual student behavior.

### *Setting*

The study was performed at a public upper-secondary school in Rafha, Northern Borders Region, Saudi Arabia. The school serves approximately 400 students and operates between 7:00 a.m. and 1:00 p.m., with each class session lasting 50 minutes.

### *Participants*

Four male upper-secondary school students were within the age range of 15–18 years old. Students 1 and 2 were in Grade 11, while Students 3 and 4 were in Grade 12. All four students frequently displayed disruptive behaviors, including making noise, throwing objects, and expressing anger. They also demonstrated academic disengagement, such as failing to complete homework, refusing to participate in classroom activities, not cooperating with their peers during classwork, and not responding to teachers' questions or instructions. Each student

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


was individually observed for five classroom sessions to document their behavioral patterns and academic engagement levels. Table 1 provides a detailed breakdown of each student's specific behavioral and academic challenges.

**Table 1**
*Demographic Information for the Four Students*

| Student | Grade | Age | Problem behaviors | Target of problem behaviors | Academic designment behaviors | Target academic engagement behaviors |
|---|---|---|---|---|---|---|
| 1 | 17 | 11th | Throwing his objects, refusing teachers' requests, hitting and threatening others, moving and speaking in the classroom without permission, joking, making disruptive noises | Listening to teachers' instructions, following teachers' requests, seeking permission before speaking or moving, and communicating appropriately | Failing to complete academic tasks and homework, sitting inappropriately, avoiding participation in classroom discussions and group work, and failing to bring required class materials | Completing class assignments and homework, sitting properly, willing to participate in answering teachers' questions and group work, being ready, and bringing all materials into the class |
| 2 | 18 | 11th | | | | |
| 3 | 17 | 12th | | | | |
| 4 | 18 | 12th | | | | |

In addition, the four teachers who educated the students and two observers participated in the study. The teachers included subject teachers for Mathematics, Arabic, English, and Science. The teacher's responsibility is to participate in the implementation of the intervention procedures. Additionally, the two male graduate students served as observers, responsible for collecting data on the students' behaviors. Both teachers and observers received two training sessions on how to implement the behavioral contract intervention, collect, and code data across all six phases of the study design.

*Independent Variable (Behavioral Contract Intervention)*

The independent variable was the behavioral contract intervention, a written agreement formed between the students and their school counselor. The contract outlined target behavioral goals (appropriate behaviors and academic engagement behaviors), problematic behaviors (undesired behaviors that should be minimized or eliminated), and rewards and consequences (incentives for positive behavior and penalties for violations). Each student reviewed the contract individually with the school counselor, who explained all expectations. Once the students fully understood the agreement, they signed it. During the intervention phase, students met with the school counselor daily to discuss their progress in adhering to the contract.

*Dependent Variables*

The behavioral contract intervention aimed to reduce two dependent variables, namely problematic behaviors and academic disengagement behaviors. The difficult behaviors included throwing objects, refusing teachers' requests, hitting and threatening others, moving and talking in the classroom without permission, joking, and making disruptive noises. The academic disengagement included failing to complete academic tasks and homework, sitting inappropriately, avoiding participation in classroom discussions and group work, and failing to

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


bring required class materials. The intervention also sought to increase two dependent variables: appropriate behaviors and appropriate academic engagement behaviors. The target appropriate behaviors were listening to teachers' instructions, following teachers' requests, seeking permission before speaking or moving, and communicating appropriately. The appropriate academic engagement behaviors were completing class assignments and homework, sitting appropriately in class, participating in discussions and group activities, and being prepared with all required materials.

### *Instruments*

Multiple measurement instruments were used in this study. These tools included Social, Academic, and Emotional Behavior Risk Screener, Antecedent-Behavior-Consequence assessment, daily progress report, and social validity survey. These tools are discussed in the below sections.

Social, Academic, and Emotional Behavior Risk Screener was used to determine students at risk of behavioral, emotional, and academic difficulties. This tool consists of 19 items divided into three categories: social behaviors, academic behaviors, and emotional behaviors. Teachers were required to assess their students by using this tool to determine eligibility for participation in the study (Kilgus et al., 2021).

Each student was observed in their classroom by using an Antecedent-Behavior-Consequence assessment to record and analyze the triggers of antecedents, behaviors, and consequences of their actions. Each student's behaviors were observed and recorded in recording each student before, during, and after exhibiting behaviors. This data sheet was used before starting the study to help understand each student's behavior.

Two daily progress reports were used. One was used to report and monitor each student's problematic and academic disengagement behaviors. Another daily progress report was used by two trained observers to monitor each student's behavior throughout all study phases. Observers collected data simultaneously for each student in their respective classrooms. A minimum of 90% agreement between the two observers was required for data reliability. If the agreement fell below 90%, the data was reviewed for accuracy. The observers' data served as the primary source for evaluating the intervention's effectiveness. Another daily progress report was used by classroom teachers to assess each student's behavior throughout class sessions. This assessment was used during the application of the study (Stage et al., 2012).

Social validity surveys were also used to measure perceptions of the intervention. Social validity surveys were adapted by Witt et al. 1985 and developed by Umbreit et al. 2007. This instrument was used and supported by many studies (e.g., Gann & Kunnavatana, 2016). It was administered to both students and their teachers before and after implementation. The surveys included open-ended and multiple-choice questions. Administering the survey twice allowed for a comparison of perceptions before and after the intervention, helping to determine whether participants' attitudes were revised as a result of the behavioral contract intervention. Both students and teachers had given the survey two times with the same questions, and open questions that helped these participants to provide all their opinions about the intervention.

### *Procedures*

This study followed several procedure steps, categorized into three primary phases: before the study, during the study, and after the study. Each phrase is detailed below.

First, before implementing the study, the researcher obtained approval from the scientific research ethics committee of Northern Borders University and the Education Research Centre at the Ministry of Education. Once approved, a presentation was conducted for the school

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


administration and educators to describe the intent of the study and the behavioral contraction intervention. After the presentation, informed consent forms were acquired from the school principal, teachers, students, and their parents to confirm their participation in the study. Moreover, all participants, including students, their teachers, and observers, obtained training sessions on the intervention procedures. After the training, both students and teachers completed pre-intervention social validity surveys to gather their initial perceptions of the intervention.

Second, throughout the study, two trained observers monitored the four participating students by using the DPR while they attended their classes in all study phases. Observations were conducted for 15 minutes per session in each student's class during the school day. To ensure reliability, the inter-observer agreement needed to be at least 90%. Each student's teacher also used a separate DPR tool to evaluate and record student behavior. At the end of each class, educators engaged in individual discussions with students to provide feedback, reinforce positive behaviors, and encourage improved behavior when necessary.

The study employed a six-phase design, comprising two phases of the baseline followed by two phases of the intervention, followed by generalization and maintenance phases. During both baseline phases, the observers monitored each student without administering the intervention. During both intervention phases, the two observers continued to monitor each student after administering the intervention. During the intervention phases, each student met the school counselor daily to discuss behavioral goals, received rewards or reinforcement for achieving the goals, and received additional guidance if they struggled to meet expectations.

During the generalization phase, the two observers monitored the students in a different classroom with teachers who were not part of the intervention to assess whether students generalized the learned behaviors. During the maintenance phase, the two observers reassessed students' behavior three months after the intervention had been completed to determine long-term effectiveness.

Third, at the conclusion of the experimental study, both students and teachers finished the social validity survey to evaluate their post-intervention perceptions. These responses helped determine the effect of the intervention in reducing problem conduct and improving academic engagement. Following data collection, all study data were analyzed and are presented in the results section.

### *Data Analysis*

All data collected regarding each student's behavioral problems and academic engagement behaviors was presented visually as results of the study in graphs. This visual data can help to identify each student's target behaviors visually and the level of improvement by looking at each phase. Also, this can help to determine the correlation between intervention and target behaviors (Horner et al., 2005). Moreover, Microsoft Excel (2021) was used to visualize data and generate graphs. Moreover, many types of statistical methods were included, such as mean-level analysis, percentage of data without overlap (PND), and p-values. The calculation of PND and also p-values were employed to assess the effect of the behavioral contract intervention on the four upper-secondary students. The Web app developed by Tarlow and Penland (2016) was used to calculate the percentage of nonoverlapping and data representing proportions in each baseline phase 1 vs intervention phase 1 and baseline phase 2 vs intervention phase 2. Result indications of PND that are above 90% indicate a strongly effective intervention, 50% to 70% indicate questionable effective intervention, and less than 50% indicate unreliable intervention (Alresheed et al., 2013). Tarlow and Penland supported that the use of PND and p-values are useful statistical ways that can be used for effect size measurement, especially with a single-case experimental design and a small sample size of participants.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


## Research Results

The study found that the behavioral contract intervention was successful in addressing the targeted behaviors in reducing problem behaviors, such as refusing teachers' requests and making disruptive noise, and enhancing academic engagement behaviors as finishing academic assignments and tasks, and sitting appropriately.

### *Problem Behaviors*

Table 2 displays the statistical results of the intervention's effect on reducing problem behaviors among the four students. The findings indicate that the behavioral contract intervention had a significant helpful effect on all participants. For Student 1, problem behaviors decreased significantly by 41% ($p < .0025$) between baseline phase 1 and intervention phase 1, and by 25% ($p < .025$) between baseline phase 2 and intervention phase 2. For Student 2, problem behaviors were reduced by 50% ($p < .0025$) between baseline phase 1 and intervention phase 1, and by 33% ($p < .025$) between baseline phase 2 and intervention phase 2.

For Student 3, problem behaviors decreased by 63% ($p < .0025$) between baseline phase 1 and intervention phase 1, and by 42% ($p < .025$) between baseline 2 and intervention phase 2. For Student 4, problem behaviors were reduced by 23% ($p < .0025$) between baseline phase 1 and intervention phase 1, and by 15% ($p < .025$) between baseline phase 2 and intervention phase 2. Additionally, during the generalization and maintenance phases, all four students maintained reduced behavioral problems compared with the baseline phases. However, the most significant improvements were observed during the intervention phases, suggesting that the behavioral contract intervention was most effective when actively implemented.

**Table 3**

*Descriptive Results of All Four Students in the Reduction of Problem Behaviors*

| DV | Students | Mean % (*SD*) | | | | | | % Shift | | PND | | *P vaule* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A-1 | B-1 | A-2 | B-2 | G | M | A-1 vs B-1 | A-2 vs B-2 | A-1 vs B-1 | A-2 vs B-2 | A-1 vs B-1 | A-2 vs B-2 |
| Problem Behaviors | 1 | 53 (5) | 12 (4) | 28 (2) | 3 (2) | 18 (4) | 14 (1) | 41 reduced | 25 reduced | 100 | 100 | .0025 | .0025 |
| | 2 | 56 (4) | 6 (4) | 34 (4) | 1 (2) | 10 (4) | 21 (7) | 50 reduced | 33 reduced | 100 | 100 | .0025 | .0025 |
| | 3 | 72 (6) | 9 (6) | 46 (6) | 4 (2) | 20 (3) | 14 (3) | 63 reduced | 42 reduced | 100 | 100 | .0025 | .0025 |
| | 4 | 29 (5) | 6 (2) | 16 (4) | 1 (2) | 12 (3) | 14 (3) | 23 reduced | 15 reduced | 100 | 100 | .0025 | .0025 |

*Note.* A-1 = Baseline; B-1= Treatment; A-2 = Baseline; B-2 = Treatment; G = Generalization; M = Maintenance; DV= Dependent Variables; *SD*= Standard Deviation.

### *Academic Engagement Behaviors*

Table 3 presents statistical data on the effect of behavioral contract intervention in enhancing academic engagement behaviors among the four students. The findings indicate a positive effect of the intervention, with all four students benefiting from its implementation. For

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Student 1, academic engagement behaviors increased significantly by 40% ($p < .0025$) between baseline phase 1 and intervention phase 1, and by 30% ($p < .025$) between baseline phase 2 and intervention phase 2. For Student 2, academic engagement behaviors increased by 57% ($p < .0025$) among baseline phase 1 and intervention phase 1, and by 4% ($p < .025$) between baseline phase 2 and intervention phase 2.

For Student 3, academic engagement behaviors increased by 79% ($p < .0025$) between baseline phase 1 and intervention phase 1, and 21% ($p < .025$) between baseline phase 2 and intervention phase 2. For Student 4, academic engagement behaviors increased by 42% ($p < .0025$) among baseline phase 1 and intervention phase 1, and by 31% ($p < .025$) throughout the second baseline phase and the subsequent intervention phase. Both the first and second intervention phases demonstrated a greater increase in academic engagement behaviors compared with both phases (generalization and maintenance) for all four students. However, only Student 1 continued to show an increase in behaviors related to academic engagement in both phases (generalization and maintenance) versus the first and second baseline phases. By contrast, Students 2, 3, and 4 exhibited better improvements in academic engagement behaviors, but the increase in the baseline of the two phases was greater than within the generalization and maintenance phases.

**Table 4**

*Descriptive Results of All Four Students in the Increase of Academic Engagement Behaviors*

| DV | Students | Mean % (*SD*) | | | | | | % Shift | | PND | | *P value* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A-1 | B-1 | A-2 | B-2 | G | M | A-1 vs B-1 | A-2 vs B-2 | A-1 vs B-1 | A-2 vs B-2 | A-1 vs B-1 | A-2 vs B-2 |
| Academic Behaviors | 1 | 15 (3) | 55 (7) | 42 (2) | 72 (4) | 43 (2) | 44 (4) | 40 increased | 30 increased | 100 | 100 | .0025 | .0025 |
| | 2 | 8 (2) | 65 (3) | 43 (3) | 56 (7) | 52 (6) | 39 (8) | 57 increased | 4 increased | 100 | 100 | .0025 | .0025 |
| | 3 | 1 (2) | 80 (4) | 67 (5) | 88 (5) | 37 (5) | 33 (4) | 79 increased | 21 increased | 100 | 100 | .0025 | .0025 |
| | 4 | 12 (3) | 54 (5) | 38 (2) | 69 (6) | 37 (4) | 32 (2) | 42 increased | 31 increased | 100 | 100 | .0025 | .0025 |

*Note.* A-1 = Baseline; B-1= Treatment; A-2 = Baseline; B-2 = Treatment; G = Generalization; M = Maintenance; DV= Dependent Variables; *SD*= Standard Deviation.

*Reduction of Problem Behaviors and Enhancing Academic Engagement Behaviors*

Student 1. Figure 1 presents a graphical and visual representation of problem behavior occurrences and also behaviors related to academic engagement for Student 1 across all study phases. The results indicate that the behavioral contract intervention was beneficial in reducing problem behaviors and also enhancing behaviors related to academic engagement for this student.

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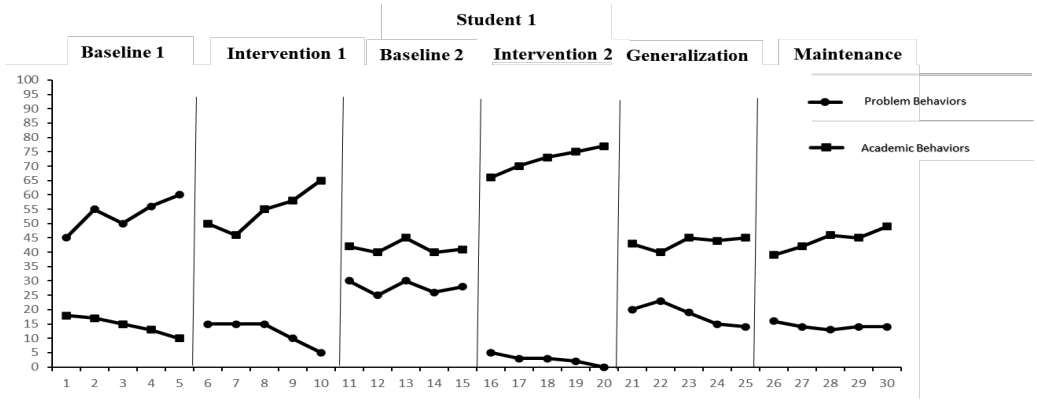
PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Figure 1**
*Reduction of the Problem Behaviors and Enhancing Academic Behaviors in Student 1*




For problem behaviors, within the first phase of baseline measurement, Student 1 exhibited problem behaviors at a rate of 53% (*SD* = 5). Upon introduction of the behavioral contract intervention, problem behaviors were reduced to 12% (*SD* = 4). There was no data overlap (PND = 100%), and they were monitored from the baseline to the intervention phases. Throughout the baseline phase 2, problem behaviors increased to 28% (*SD* = 2) but dropped to 3% (*SD* = 2) when the intervention was reintroduced through intervention phase 2. Again, no data overlap was observed (PND = 100%) among the second phases of baseline and intervention. In the generalization phase, Student 1 exhibited 18% (*SD* = 4) problem behaviors. In the maintenance phase, problem behaviors were further reduced to 14% (*SD* = 1).

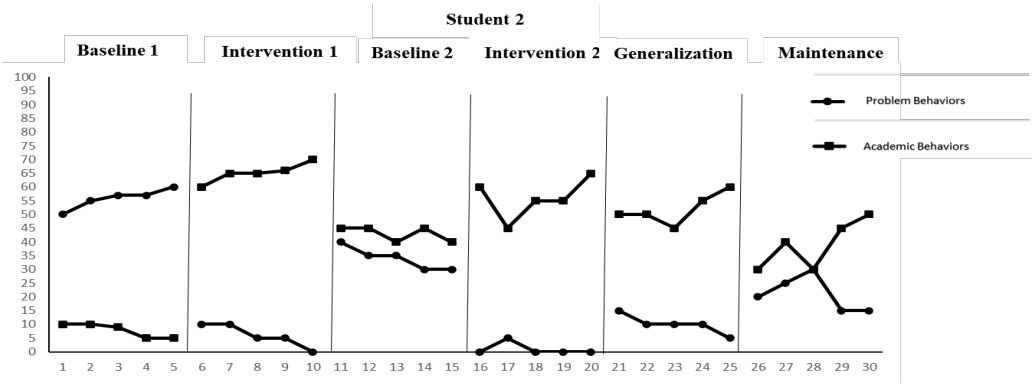
For academic engagement behaviors, in baseline phase 1, student 1 exhibited academic behaviors at a rate of 15% (*SD* = 3). Upon introduction of the behavioral contract intervention, academic engagement behaviors increased to 55% (*SD* = 7). There was no data overlap (PND = 100%), and they were monitored within the first phases of baseline and intervention. Throughout baseline phase 2, academic behaviors were 42% (*SD* = 2) but increased to 72% (*SD* = 4) when the intervention was reintroduced. Again, results point out that no data overlap occurred (PND = 100%) between the second baseline and intervention phases. In the generalization phase, academic engagement behaviors were 43% (*SD* = 2). In the maintenance phase, academic engagement behaviors remained at 44% (*SD* = 4).

Student 2 in Figure 2 presents a graphical and visual representation of problem behaviors and behaviors related to academic engagement. For Student 2, across all study phases, the results indicate that the behavioral contract intervention was found useful in reducing problem behaviors and enhancing behaviors related to academic engagement.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Figure 2**

*Reduction of the Problem Behaviors and Enhancing Academic Behaviors in Student 2*




For problem behaviors, the percentage of exhibited problem behaviors was 56% (*SD* = 4) during phase one of the baseline. After presenting the behavioral contract intervention, this percentage decreased to 6% (*SD* = 4). Results indicated no data overlap occurred (PND = 100%) among the first phases of baseline and intervention. Throughout baseline phase 2, Student 2 exhibited 34% (*SD* = 4) of problem behaviors, which further decreased to 1% (*SD* = 2) after the intervention was reimplemented again in the second phase of intervention. Again, there was no data overlap (PND = 100%) observed within the second phases of baseline and intervention. In the generalization phase, student 2 problem behaviors were observed at 10% (*SD* = 4). Through the maintenance phase, the percentage increased to 21% (*SD* = 7).

For academic engagement behaviors, Student 2 exhibited 8% (*SD* = 2) of academic behaviors in phase one of the baseline. Following the behavioral contract intervention introduced within the phase of baseline, the percentage reached an increase of 65% (*SD* = 3), with no data overlap (PND = 100%) among the first phases of baseline and intervention. Through the second phase of baseline, Student 2 exhibited 43% (*SD*=3) of academic engagement behaviors, which further increased to 56% (*SD* = 6) after the intervention was reintroduced in the second phase of intervention. Again, there was no data overlap (PND = 100%) observed between the second phase of the baseline and intervention phases. In the phase of generalization, academic behaviors were observed at 52% (*SD* = 6). Through the maintenance phase, the percentage slightly declined to 39% (*SD* = 8).

Student 3 in Figure 3 illustrates a graphical and visual representation of the percentage of problem behaviors as well as behaviors related to academic engagement for Student 3 across all phases. The behavioral contract intervention was a successful intervention for reducing behavioral problems and enhancing academic engagement behaviors for student 3.

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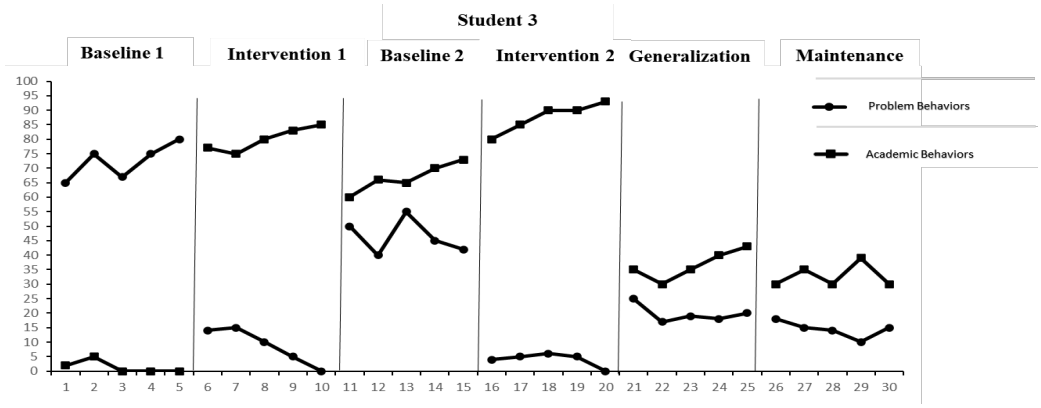
PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Figure 3**
*Reduction of the Problem Behaviors and Enhancing Academic Behaviors in Student 3*



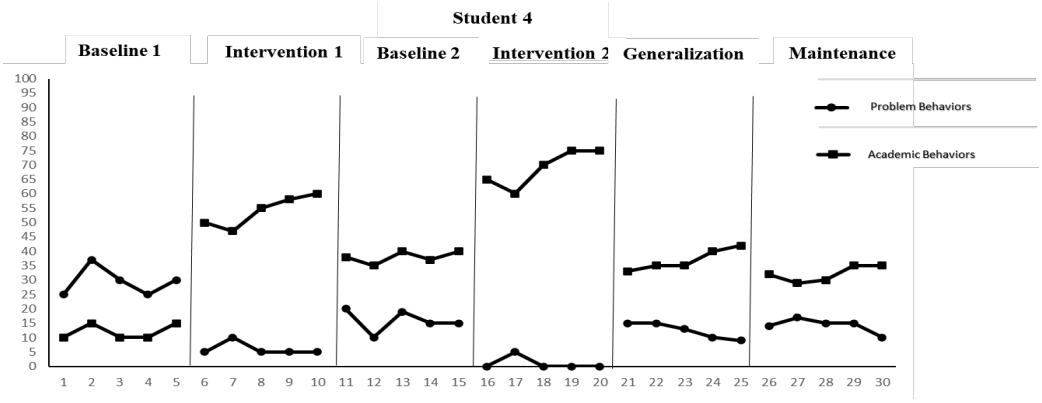

For problem behaviors, Student 3 exhibited 72% (*SD* = 6) of problem behaviors in baseline phase 1. After the behavioral contract intervention was introduced in the first phase of the baseline, the percentage dropped to 9% (*SD* = 6), and no data overlap occurred (PND = 100%) between phases one of the baseline and intervention. Through baseline phase 2, Student 3 exhibited 46% (*SD* = 6) of problem behaviors, which further reduced to 4% (*SD* = 2) after the intervention was reintroduced through intervention phase 2. Again, no data overlap occurred (PND = 100%) among the second phases of the baseline and intervention. Through the generalization phase, the measured percentage of observed problem behaviors was 20% (*SD* = 3), while through the maintenance phase, the percentage reduced further to 14% (*SD* = 3).

For academic engagement behaviors, Student 3 exhibited only 1% (*SD* = 2) of academic engagement behaviors through phase one of the baseline observation. After the behavioral contract intervention was introduced through phase one of the baseline, there was an increase in this percentage to 80% (*SD* = 4), with no data overlap (PND = 100%) among the first phases of baseline and intervention. Through baseline phase 2, Student 3 exhibited 67% (*SD* = 5) of academic engagement behaviors, which further increased to 88% (*SD* = 4) when the intervention was reintroduced through the second intervention phase. No data overlap occurred (PND = 100%) in the second phase of the baseline phase to the intervention phase. The percentage of academic engagement behaviors was 37% (*SD* = 5) through the phase of generalization. However, through the maintenance phase, the percentage reduced further to 33% (*SD* = 4).

Student 4. Figure 4 presents a graphical and visual representation of the measured percentage of problem behaviors as well as behaviors related to academic engagement for Student 4 across all phases. The behavioral contract intervention was found to be a useful intervention in reducing problem behaviors and enhancing academic engagement behaviors for Student 4.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Figure 4**
*Reduction of Problem Behaviors and Enhancing Academic Behaviors in Student 4*




For problem behaviors, Student 4 exhibited 29% (*SD* = 5) of problem behaviors in baseline phase 1. After the behavioral contract intervention was introduced throughout phase one of the baseline, the percentage was reduced to 6% (*SD* = 2), and to phase one of the intervention. Through the second phase of the baseline, Student 4 exhibited 16% (*SD* = 4) of problem behaviors, which further reduced to 1% (*SD* = 2) after the intervention was reintroduced once again in the second phase. Results point out that no data overlap occurred (PND = 100%) among the second phases of the baseline and intervention. Through the generalization phase, the problem behaviors percentage was 13% (*SD* = 3), while through the maintenance phase, the percentage reduced further to 14% (*SD* = 3).

For academic engagement behaviors, Student 4 exhibited 12% (*SD* = 3) of academic engagement behaviors in the first phase baseline. Subsequently, the behavioral contract intervention was introduced during the first phase of baseline; the percentage went up to 54% (*SD* = 5), with no data overlap occurring (PND = 100%) from the first phase of baseline to the first phase of the intervention. Through baseline phase 2, Student 4 exhibited 38% (*SD*=2) of academic behaviors, which further increased to 69% (*SD* = 6) after the intervention was reintroduced through the second intervention phase. Again, no data overlap occurring (PND = 100%) was observed between the second baseline and intervention phases. In the generalization phase, academic engagement behaviors were observed at 37% (*SD* = 4). Within the maintenance phase, the observed percentage slightly declined to 32% (*SD* = 2).

### *Social Validity*

Both students and teachers responded positively regarding the social validity assessment of the behavioral contract intervention before and after the study. Before implementation, participants expressed optimism about the intervention's potential benefits. They indicated that the behavioral contract intervention can help reduce problem behaviors and improve behaviors related to academic engagement. At the end of the research period, all students and teachers confirmed that the behavioral contract intervention was highly beneficial in reducing problem behaviors and enhancing behaviors related to academic engagement. Educators also mentioned that the intervention was easy to implement and manage their students' behaviors. Moreover, all students reported benefiting from the intervention, stating that it helped them manage their behaviors and exhibit good academic behaviors.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


## Discussion

The results of the research study found that the behavioral contract intervention was a useful intervention for all participating students. Findings indicated that all four upper-secondary students benefited from the behavioral contact intervention, in addressing problem behaviors and enhancing academic engagement behaviors. The primary goal of the study was to evaluate the outcomes of the behavioral contraction intervention in reducing problematic behaviors and enhancing academic engagement among four male upper-secondary school students, and to identify that the intervention showed a positive effect for the two independent variables.

All four students exhibited a notable reduction in problem behaviors following the intervention. Initially, they displayed high percentages of problem behaviors through the first baseline phase. However, after they received both phases of the intervention, their problem behaviors decreased markedly. A comparison of both baseline phases confirms that the students benefited from the intervention in reducing problem behaviors. It was clear that all four students reduced their problem behaviors and enhanced the display of academic engagement behaviors after receiving the intervention.

Student 4 exhibited only 29% of problem behaviors observed throughout the first phase of baseline, while the other students displayed problem behaviors exceeding 50%. Despite this variation, all four students reduced their problem behaviors to below 10% during the second intervention phase. Moreover, the generalization and maintenance phases showed that all four students continued to exhibit fewer problem behaviors compared to the first baseline phase. This suggests that the intervention helped students generalize what they had learned in different settings and retain these behavioral improvements over time. The data from the study found consistent results with those of other research (e.g., Edgemon et al., 2021; Sari et al., 2022), which also found that behavioral contract intervention is a useful intervention in reducing problem behaviors. Moreover, behavioral contract intervention is considered an evidence-based intervention not only for reducing problem behaviors but also for enhancing academic engagement behaviors (Mruzek et al., 2007; Sidiq et al., 2020).

At the beginning of the study, none of the four students demonstrated academic engagement behaviors, such as raising their hands to answer questions and completing their homework. The results indicated that all four upper-secondary students initially showed low levels of academic engagement. However, after the intervention was introduced, they significantly increased their academic engagement behaviors. Furthermore, through the generalization and maintenance phases, all four upper-secondary students demonstrated sustained high levels of academic engagement behaviors when their behaviors were compared with the first baseline phase. This suggests that the behavioral contact intervention not only helped students enhance academically but also enabled them to generalize and retain these positive behaviors over time. These results also found the same findings as other research (e.g., Lederer & Stolow, 2021; Nurudducha, 2024; Sari & Ayriza, 2021), which support the effect of behavioral contract interventions in enhancing academic engagement behaviors.

Finally, the study results indicated a direct relationship between problem behaviors and academic engagement behaviors: as problem behaviors decreased, academic engagement behaviors increased. This finding aligns with the results of other studies (e.g., Edgemon et al., 2021; Nurudducha, 2024), demonstrating that behavioral contract interventions effectively reduce problem behaviors while promoting academic engagement. Additionally, the intervention helped students improve self-regulation and manage both academic and non-academic engagement behaviors. All four participants who participated in the study were initially identified as being in danger of exhibiting problem behaviors and academic disengagement. However, after the intervention was implemented, they all demonstrated significant improvements, reducing problem conduct and increasing academic engagement behaviors. The study's findings

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


indicated similar results to other studies (e.g., Alwis, 2023; Fatimah et al., 2023; Yusuf et al., 2017) that supported the use of behavioral contact intervention for reducing problem behaviors and enhancing behaviors related to academic engagement.

### *Limitations and Recommendations*

The study has several limitations, along with recommendations for future studies and practices. First, the study involved a limited number of participants. The study included only four male students. Future research should expand the sample size and examine the effect of the intervening female students. Second, participants were in danger of exhibiting problem behaviors and academic disengagement. Future studies should assess the intervention's effectiveness among students diagnosed with behavioral and emotional disorders or learning disabilities. Third, direct observations were used to collect data while students attended their classes, which may have influenced their behavior due to awareness of being monitored. Future research should consider using security cameras or alternative observation methods to capture more natural behavior.

Each study phase included only five sessions, which may not have been sufficient for students to fully internalize the intervention. Future research should extend the number of sessions in each phase by at least 10. Data collection was limited to specific classes, meaning students were not observed across all their subjects. Future research should assess students' behaviors across multiple classroom settings to determine the intervention's broader effectiveness. Social validity surveys were conducted privately, which may have limited the depth of feedback received. Future research could incorporate face-to-face interviews to obtain more detailed insights about participants' experiences with the intervention.

## Conclusions and Implications

In the literature review, many studies support the use of the behavioral contract intervention, especially with students who show problem behaviors and behaviors related to academic engagement. However, there is a notable gap that the intervention used with upper-secondary school students in Saudi Arabia, and this study aimed to explore how the intervention helped the four Saudi male upper-secondary students reduce behavioral problems and enhance academic disengagement behaviors. The findings obtained from this study revealed that behavioral contract interventions were an intervention proven to reduce problem behaviors and enhance behaviors related to academic engagement for all four students. Based on the study's findings, behavioral contract interventions were an effective intervention and recommended for use in educational settings to support students' academic and behavioral development.

The study suggested several implications for teachers, students, schools, and stakeholders. Behavioral contract interventions can assist students in managing their behaviors and behaving well in school. Also, teachers can use the intervention as a strategy with their students who exhibit behavioral problems and academic disengagement behaviors. The intervention can help teachers to enhance their students' behaviors and educational performance. The behavioral contract intervention can be the role of the school's policy to address students' problem behaviors. Moreover, as a result of the investigation's literature, there is a gap in the research on the investigation of the effect of using behavioral contract intervention in Saudi Arabia. Future researchers should implement the behavioral contract intervention with different students in Saudi Arabia, such as students with and without disabilities who are enrolled in different school grades.

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## Declaration of Interest

The authors declare no competing interest.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025
196

# ADVANCING CRITICAL LITERACY THROUGH CRITICAL LITERATURE PEDAGOGY-BASED PRINCIPLES OF LITERARY EDUCATION

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## Abstract

*Critical Literature Pedagogy (CLP) is a teaching and assessment approach that promotes reading against the text and critically examining biases, norms, and stereotypes in literature. As literature teachers have limited knowledge of the use of CLP as an educational approach to teaching and assessment of literature, this practical action research explored changes in pre-service English teachers' knowledge of CLP following an educational intervention at a state-operated teacher education college in the Philippines. The quasi-experimental study involved 69 third-year pre-service English language teachers in a teacher education college in Central Luzon, Philippines. Results showed a significant increase in CLP knowledge, with participants' mean scores rising from 2.87 (Knowledgeable) to 3.73 (Very Knowledgeable). The improved CLP knowledge was further analyzed through factor analysis using PCA with a rotated component matrix, identifying four key components for developing CLP-based principles for literary education. Qualitative findings reinforced these results, highlighting CLP's impact on content and pedagogical knowledge while also revealing challenges related to teachers, students, and administration. Strategies for addressing these barriers were grouped into three categories: Technological, Pedagogical, and Content Knowledge. The study's results provide valuable insights for enhancing practices and curriculum design in literature education.*

**Keywords**: *critical language pedagogy, critical literature pedagogy, teaching of literature, critical literacy*

## Introduction

Literature education and its assessment practices play a crucial role in the Philippine Basic English education program. It is embedded in the K to 12 English language program content standards. In primary education, from Grades 1 to 3, the focus of literature education in the curriculum is simply on recognizing and noting down the details about story elements such as characters, setting and events. As learners progress from Grades 4 to 5, the emphasis shifts to writing original short stories using the story elements. By Grade 6, the curriculum transitions from short stories to narrative texts (DepEd English MELCs, 2020). Notably, the primary English language program curriculum lacks a specific list of literary texts that must be utilized in teaching and assessment of literature based on the Most Essential Learning Competencies Curriculum Guide.

Conversely, English language literature programs in junior high school differ significantly from those in primary. The content standards from Grade 7-10 aim to develop communicative competence through the study and appreciation of various literary genres, including Philippine Literature, Afro-Asian Literature, British-American Literature, and World

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Literature. Specifically, in Grade 7, the focus is on understanding how Philippine Literature reflects the country's culture, history, environment, and how it can promote non-violent conflict resolution and cultural understanding. Moreover, Philippine literature seeks to enable students to assert their identity, understand, and collaborate with their peers toward being a part of a global community. In Grade 8, the literature discussion is limited to one quarter and focuses on analyzing literature to understand diverse backgrounds and shared heritage. In Grade 9, the emphasis is on connecting literature to particular real-life social issues, concerns, and dispositions to understand the unchanging values in the world, while in Grade 10, the students analyze literary text using various literary criticism approaches, such as formalist, moralist, Marxist, feminist, historical, and reader response (DepEd English MELCs, 2020).

The culmination of teaching literature in the K to 12 English language program is in upper-secondary, integrating the 21st-century literature from the Philippines and the world in a subject named the same, encompassing various dimensions, genres, elements, structures, context, and traditions (Department of Education, 2019). The Department of Education supplies books and modules containing the specific literature texts that would be covered in the delivery of literary instruction. That is to say, the literature to be discussed in class is prescribed, but because of limited provisions for learning materials such as textbooks or modules, school administrators have given literature teachers the thrust of developing their materials, and essentially, choosing the literature to be included in the discussion, according to their judgment. However, Hall (2005) has claimed that many teachers did not make an effort to make literature texts diverse in terms of seeking multicultural and diverse authors.

### *From Literary Criticism to Critical Literature Pedagogy*

In literature education in the Philippines, several literary theories are utilized to enhance students' understanding and interpretation of literary works. Traditional literary criticism theories include Archetypal criticism, Cultural criticism, Feminist criticism, Marxist criticism, New criticism, Psychoanalytic criticism, and Reader Response.

For instance, to identify themes, characterization and patterns in a literary text, Carl Jung and Frye's archetypal criticism may be used, but it does not examine why the archetypes exist (Walker, 2002). On the other hand, cultural criticism with its interdisciplinary characteristic, looks beyond the literature toward practices that represent a culture's belief system and values, and emphasizes the historical and cultural context of the literary piece (Abrams, 1999; Murfin et.al, 1997).

Another approach is the use of Feminist criticism, which analyzes literary text through the lens of gender inequality, gender stereotypes, and patriarchy (Abrams, 1999; Lynn, 1998; Murfin et.al, 1997). Feminist criticism has established gender as a significant category in literary analysis (Jocson, 2020). Similarly, Marxist criticism, influenced by Karl Marx, sees literature through the lens of class struggle, where the dominant class interest dictates the normative values and ideologies (Abrams, 1999).

On the other hand, in New Criticism, close analysis of the text is performed, emphasizing the form and content, without consideration of the author's background and intent or how the reader relates to the literary work (Biddle & Fulwiler, 1989; Lynn, 1998; Murfin et.al, 1997). Additionally, in Psychoanalytic criticism, rooted in Freudian theory, the students aim to discover the subconscious of authors and the characters as evident in the symbolism within the texts. It also attempts to understand the unconscious desires of the readers (Freud, 1993). Finally, in Reader-response, the analysis is focused on the student readers, highlighting their personal values, perspectives, and experiences that influence how students create meaning as they interpret the literary work (Fish, 1980). These literary theories, when used effectively in the literature classroom, serve as great instructional practices for analyzing literature. They

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025



enable teachers to make the teaching and assessment of literature more student-centered (López et al., 2006).

However, this study argues that literature teachers need to develop a more inclusive pedagogy, such as Critical Literature Pedagogy, as the discussed literary criticism theories tend to focus on only one specific issue in the literary text, not recognizing the interconnected nature of the social injustices (Ainscow, 2020).

### *Toward a Critical Literature Pedagogy*

Critical Literature Pedagogy (CLP) is rooted in Critical Pedagogy (CP) by Freire (1970) and Giroux (1992). CP aims to debunk what Freire (1970) has referred to as banking education, where the teacher is the font of knowledge, and the students are just vessels that receive the information. Thus, the literature teacher's decision to use Critical Literature Pedagogy (CLP) instead of traditional literary criticisms, such as New Criticism and Reader Response, has a significant influence on students' engagement, the development of their critical thinking skills, and how they interpret the text.

CLP enables students to acquire critical literacy, that is, its primary objective is to address both the explicit and implicit ideologies and practices in the literary text by examining issues about power, representation, and normativity (Morell, 2007). More significantly, CLP offers opportunities for students to apply in real-life context an equity-oriented, sociopolitical action or solution to identified social issues and problems found in the text (Borsheim-Black et.al., 2014).

In addition, CLP emphasizes the importance of recognizing that the language used in literary texts is never neutral but rather carries with it the ideologies and belief systems of the author. Therefore, using CLP equips students to read with and against the text (Borsheim-Black et.al., 2014). Reading with the text means that students understand the storylines and analyze the literary devices used in the literary work. Reading against the text means that students read between the lines to have a deeper understanding of the ideologies, values, and belief systems perpetuated in the text. Through CLP, students may learn to question the normative ideas evident in literature, equipping students with critical inquiry skills and reflective thinking skills toward social transformation (Borsheim-Black et.al., 2014).

Using CLP in the classroom involves unlocking the various domains of Canonicity, Context, Elements of Literary Works, Reader Response, and Assessment. Canonicity refers to the examination of the cultural and literary value of texts and their inclusion in literature curricula. Passively accepting proclaimed and imposed literature contributes to the perpetuation and subordination of ahistorical, dominant, and oppressive power relations (Agdeppa & Metila, 2017). Imposing canonical literature hinders critical thinking development and disadvantages learners as it does not offer a space for discussion (Derince, 2011). Context, on the other hand, involves identifying the literary work's historical movements, events, and the author's life experiences (Borsheim-Black et.al., 2014). Giroux (1988) and Derince (2011) have contended that the context of the literary work must be analyzed and questioned by both the students and the teacher.

Additionally, literary elements involve identifying literary elements such as major plot points, symbols, major themes, character development, and how literary elements contribute to the theme or universality of the text (Borsheim-Black et.al., 2014). Using new criticism, for instance, as a literature pedagogy involves analysis of literary elements' contribution to the text's meaning. However, in CLP, what is highlighted are the embedded values and ideologies that the text reproduces through the representation of the characters, and how the themes support dominant belief systems.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Moreover, the Reader domain involves connecting the text to personal experiences and considering perspectives other than one's own or considering one's own perspectives in a new way to examine power and privilege (Borsheim-Black et al., 2014). That is, the reader must consider how his personal experiences and privileges impact the interpretation of the text, thus explicitly and implicitly creating meaning, restraining cultural values, and social justice (Derince, 2011). Empowering students to speak and take into account their diverse perspectives are essential to developing the literature classroom that students like (Messiou et al., 2022).

Finally, assessments involve standard literary analyses and opportunities to create and distribute texts that critique normativity for real audiences (Borsheim-Black et al., 2014). Using CLP, the emphasis is on real-life applications of literary study, that is, students are encouraged to not just be consumers of literature but become producers as well by crafting literary works that deal with social change, engaging in sociopolitical critique, and challenging dominant narratives, discourse, and practices (Borsheim-Black et.al., 2014). This means that, rather than relying on traditional methods of assessing knowledge gained from literary texts, such as analyzing characters' motives or identifying moral lessons, assessment in CLP encourages students to actively engage in creative production. They are inspired to write their own stories, compose poetry, express their perspectives through essays, and share their work with a broader audience. Instead of merely responding to existing literature, students become creators who craft and share their own narratives. Through this approach in the literature classroom, students are empowered to not just improve their academic skills but become agents of social change.

Essentially, the use of Critical Literature Pedagogy in teaching and assessing literature promotes a transformative approach compared to traditional literary criticism. By ensuring that critical literacy goals are embedded in the teaching and assessment of literature, encouraging students to read against texts, and promoting real-life applications of literary study, CLP not only enhances critical thinking but also fosters deeper understanding of ideologies perpetuated in literature (Borsheim-Black et al., 2014).

### *Research Questions*

This study advocates for the widespread adoption of CLP in literature education to cultivate critical readers, thinkers, and agents of change. As such, this study sought to explore the feasibility of utilizing CLP in the teaching and assessment of literature for pre-service English language teachers.

Specifically, this study sought to answer the following research questions:

1. To what extent is the knowledge of Critical Literature Pedagogy (CLP) of pre-service English teachers before and after introduction to CLP as an approach to teaching and assessment of literature in terms of its five domains: (a) Canonicity? (b) Context? (c) Literary elements? (d) Reader response? (e) Assessment?

2. Is there a significant difference in the knowledge of Critical Literature Pedagogy of pre-service English teachers before and after introduction to CLP as an approach to teaching and assessment of literature in terms of its five domains?

3. How can the results be used to develop a Critical Literature Pedagogy-based framework that provides guiding principles for teaching literature?

4. How will the knowledge of Critical Literature Pedagogy as an approach to teaching and assessment of literature contribute to the pre-service English teacher's content and pedagogical knowledge?

5. What are the challenges that may arise in the use of CLP as an approach in teaching and assessment of literature, and what strategies may be recommended to overcome challenges iterated?

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


## Research Methodology

### *General Background*

The research design employed in the study is practical action research which is a form of self-reflective enquiry undertaken in educational institutions by teachers in order to improve the rationality and justice of their own practices, their understanding of these practices, and the situations in which the practices are carried out (Carr & Kemmis, 1986). The practical action research is the most useful design because the study is focused on increasing the capacity and ability of future practitioners, the pre-service English language teachers, rather than contributing to a theoretical body of knowledge. Specifically, quasi-experimental design was used to implement the training intervention on CLP for pre-service English teachers, as the sample was purposively chosen. The intervention was implemented during the second semester of the academic year 2023-2024, which lasted for four months, conducted for three hours a day, on a weekly basis.

### *Sample*

The participants were purposively chosen pre-service English language teachers, enrolled in a teacher education college in a university in Central Luzon, Philippines. The criteria taken into account for participation include: (1) being currently enrolled as pre-service English language teachers, (2) willingness to attend the intervention on the use of CLP, (3) willingness to design and implement literature lessons using CLP, and (4) willingness to participate in the study. In the recruitment process, 80.25 percent of the total target population agreed to participate in the study. It was comprised of 69 third-year pre-service English language teachers, 52 females and 17 males.

### *Instrument and Procedures*

A researcher-developed instrument was used to collect the level of CLP knowledge of pre-service teachers before and after exposure to CLP as an approach to teaching and assessment of literature in terms of the five domains – Canonicity, Context, Literary Elements, Reader, and Assessment, which were culled from literature. Likewise, qualitative questions were embedded in the survey questionnaire to explain and elaborate on the challenges, issues, and strategies that may influence the level of CLP knowledge. The 4-point Likert scale self-evaluation survey, consisting of indicators that test knowledge of CLP domains, underwent rigorous validation by three experts in language and literature education. The three validators checked for clarity, relevance, coverage, and language used for the Philippine context. Afterwards, the instrument was also subjected to pilot testing and reliability testing with a Cronbach alpha of .936 or very reliable (Adhika, 2017).

### *Data Collection Procedure*

Data collection to answer the research questions involved four phases. The first step involves communicating with the university research management office and the college dean through the college research development unit about the intent to conduct the research. Then, participants' consent was secured. Afterwards, during step 3, the self-evaluation questionnaire was administered prior to and after the implementation of the intervention. During the intervention, CLP was discussed, the participants were trained to design lesson plans using CLP as a framework, classroom observations were also conducted to evaluate the implementation

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


of CLP in the teaching and assessment of literature, and post-conference sessions were held to give feedback to the pre-service teachers after class observations. Finally, the collected quantitative data were organized using Google Sheets, while qualitative data were organized using Microsoft Word.

### *Data Analysis*

The quantitative data were analyzed using descriptive statistics and the difference between means test processed to answer research questions 1 and 2, and principal component analysis to answer research question number 3 through Statistical Package for Social Sciences v. 22, while the qualitative data were analyzed using NVivo version 10 and Clarke and Braun's Thematic Analysis protocol to answer research question numbers 4 and 5. The protocol involves five stages: (1) familiarization with the data collected, (2) open coding, (3) axial coding, (4) categorizing, and (5) identifying emerging themes. The use of thematic analysis enables interpretation of qualitative data that may support the results of the quantitative analysis. Likewise, it may inform instructional practices using CLP upon identification of challenges and issues in implementation, and strategies for improvement.

### *Ethical Considerations*

All pre-service English language teachers were informed about the purpose of the study and the research procedure through an informed consent form. The informed consent states that participation was completely voluntary, confidential, and respected the participants' anonymity. Participants are aware that they may withdraw their participation at any point in the conduct of the study.

## Research Results

### *Level of CLP Knowledge of Pre-service English Teachers*

The level of CLP knowledge of pre-service English language teachers prior to and after the intervention was measured and illustrated according to the various domains of CLP.

#### Canonicity

There was an increase in the level of Critical Literature Pedagogy knowledge of pre-service English language teachers in terms of Canonicity, with M = 2.93 (Knowledgeable) and $SD = 0.63$ prior to the introduction of CLP, compared to after introduction to CLP with $M = 3.75$ (Very Knowledgeable) and $SD = 0.31$. The effect of the intervention is measured using Cohen's $d = 1.65$, interpreted as a large effect. The difference is statistically significant with a $p$-value of .001 at $\alpha = .05$, and the null hypothesis is rejected as shown in Table 1.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 1**
*Level of CLP Knowledge in terms of the Domain of Canonicity*

| Canonicity | Pre-test *M* | Verbal Interpretation | Pre-test *SD* | Post-test *M* | Verbal Interpretation | Post-test *SD* | p-value | Decision Rule | Cohen's *d* | Verbal Interpretation |
|---|---|---|---|---|---|---|---|---|---|---|
| Literature is not ideologically neutral. | 2.65 | Knowledgeable | 0.63 | 3.57 | Very Knowledgeable | 0.31 | .001 | Reject the $N_o$ | 1.65 | Large Effect |
| Literature reinforces cultural values, dominant ideologies and social norms. | 3.24 | Knowledgeable | | 3.84 | Very Knowledgeable | | | | | |
| Literature should be examined and questioned. | 2.92 | Knowledgeable | | 3.85 | Very Knowledgeable | | | | | |
| Literature may privilege some voices and marginalized others. | 2.88 | Knowledgeable | | 3.73 | Very Knowledgeable | | | | | |
| Overall Mean | 2.93 | Knowledgeable | | 3.75 | Very Knowledgeable | | | | | |

Context

The level of Critical Literature Pedagogy knowledge of pre-service English language teachers in terms of Context increased with $M = 2.72$ (Knowledgeable) and $SD = 0.72$ prior to the introduction of CLP to $M = 3.69$ (Very Knowledgeable) and $SD = 0.42$ after introduction to CLP. The effect of the intervention is measured using Cohen's $d = 1.64$, interpreted as a large effect. The difference is statistically significant with a $p$-value of .001 at $\alpha = .05$, and the null hypothesis is rejected as shown in Table 2.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025



**Table 2**
*Level of CLP Knowledge in terms of the Domain of Context*

| Context | Pre-test *M* | Verbal Interpretation | Pre-test *SD* | Post-test *M* | Verbal Interpretation | Post-test *SD* | p-value | Decision Rule | Cohen's *d* | Verbal Interpretation |
|---|---|---|---|---|---|---|---|---|---|---|
| Literature included as reading assignments may be based mainly on prominence of the author. | 2.71 | Knowledgeable | 0.72 | 3.55 | Very Knowledgeable | 0.42 | .001 | Reject the $N_o$ | 1.64 | Large Effect |
| Literature reinforces dominant narratives. | 2.64 | Knowledgeable | | 3.58 | Very Knowledgeable | | | | | |
| Literature must interrupt the dominant narratives about issues that are relevant to society. | 2.59 | Knowledgeable | | 3.70 | Very Knowledgeable | | | | | |
| Literature must include counter-stories that make dominant ideologies visible. | 2.73 | Knowledgeable | | 3.82 | Very Knowledgeable | | | | | |
| Literature must represent individuals from marginalized populations. | 2.92 | Knowledgeable | | 3.79 | Very Knowledgeable | | | | | |
| Overall Mean | 2.72 | Knowledgeable | | 3.69 | Very Knowledgeable | | | | | |

Literary Elements

Pre-service English language teachers increased their level of Critical Literature Pedagogy knowledge in terms of Literary Elements with $M = 2.79$ (Knowledgeable) and $SD = 0.74$ prior to the introduction of CLP to $M = 3.72$ (Very Knowledgeable) and $SD = 0.33$ after introduction to CLP. The effect of the intervention is measured using Cohen's $d = 0.715$, interpreted as a moderate effect. The difference is statistically significant with a $p$-value of .001 at $\alpha = .05$, and the null hypothesis is rejected as shown in Table 3.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 3**
*Level of CLP Knowledge in terms of the Domain of Literary Elements*

| Literary Elements | Pre-test *M* | Verbal Interpretation | Pre-test *SD* | Post-test *M* | Verbal Interpretation | Post-test *SD* | p-value | Decision Rule | Cohen's *d* | Verbal Interpretation |
|---|---|---|---|---|---|---|---|---|---|---|
| Literature has characters from marginalized populations which play a secondary role in the plot of a novel, in support of a culturally dominant main character and hero. | 2.84 | Knowledgeable | 0.74 | 3.63 | Very Knowledgeable | 0.33 | .001 | Reject the $N_o$ | 0.715 | Moderate Effect |
| Literature has themes that reinforce dominant ideologies about topics like class, achievement, sexual orientation, etc. | 2.95 | Knowledgeable | | 3.79 | Very Knowledgeable | | | | | |
| Language choice and literary devices used in literature are not neutral. | 2.57 | Knowledgeable | | 3.73 | Very Knowledgeable | | | | | |
| Overall Mean | 2.79 | Knowledgeable | | 3.72 | Very Knowledgeable | | | | | |

Reader

Participants' level of Critical Literature Pedagogy knowledge in terms of Reader increased dramatically with $M = 2.96$ (Knowledgeable) and $SD = 0.73$ prior to the introduction of CLP to $M = 3.70$ (Very Knowledgeable) and $SD = 0.44$ after introduction to CLP. The effect of the intervention is measured using Cohen's $d = 1.227$, interpreted as a large effect. The difference is statistically significant with a $p$-value of .001 at $\alpha = .05$, and the null hypothesis is rejected as shown in Table 4.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025



**Table 4**
*Level of CLP Knowledge in terms of the Reader Domain*

| Reader | $M_{pre-test}$ | Verbal Interpretation | $SD_{pre-test}$ | $M_{post-test}$ | Verbal Interpretation | $SD_{post-test}$ | p-value | Decision Rule | Cohen's *d* | Verbal Interpretation |
|---|---|---|---|---|---|---|---|---|---|---|
| Literature must go beyond striking a chord and resonating with students' experiences. | 3.11 | Knowledgeable | | 3.78 | Very Knowledgeable | | | | | |
| Literature must promote students' engagements with power and difference. | 3.10 | Knowledgeable | 0.73 | 3.78 | Very Knowledgeable | 0.44 | .001 | Reject the $N_o$ | 1.227 | Large Effect |
| Students from privileged backgrounds may be inhibited in identifying dominant ideologies because they often remain invisible to individuals in privileged positions. | 2.75 | Knowledgeable | | 3.51 | Very Knowledgeable | | | | | |
| Students from privileged backgrounds may be hindered in questioning dominant ideologies because they often remain invisible to individuals in privileged positions. | 2.67 | Knowledgeable | | 3.59 | Very Knowledgeable | | | | | |
| Critical understandings of issues enable readers to connect them to similar issues relevant to other contexts. | 3.15 | Knowledgeable | | 3.85 | Very Knowledgeable | | | | | |
| Overall Mean | 2.96 | Knowledgeable | | 3.70 | Very Knowledgeable | | | | | |

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Assessment

A sharp increase in Critical Literature Pedagogy knowledge in terms of Assessment is evident among pre-service English language teachers based on their self-evaluation, with $M$ = 3.01 (Knowledgeable) and $SD$ = 0.91 prior to the introduction of CLP to $M$ =3.86 (Very Knowledgeable) and $SD$ = 0.37 after introduction to CLP. The effect of the intervention is measured using Cohen's $d$ = 1.22, interpreted as a large effect. The difference is statistically significant with a $p$-value of .001 at α = .05, and the null hypothesis is rejected as shown in Table 5.

**Table 5**
*Level of CLP Knowledge in terms of the Assessment Domain*

| Assessment | Pretest *M* | Verbal Interpretation | Pretest *SD* | Posttest *M* | Verbal Interpretation | Posttest *SD* | p-value | Decision Rule | Cohen's *d* | Verbal Interpretation |
|---|---|---|---|---|---|---|---|---|---|---|
| Literature assessment must go beyond the classroom and delve into real-life solutions to problems and issues in society. | 3.05 | Knowledgeable | 0.91 | 3.88 | Very Knowledgeable | 0.37 | .001 | Reject the $N_o$ | 1.22 | Large Effect |
| Literature influences students to ask how they can affect change based upon their critical learning. | 2.97 | Knowledgeable | | 3.84 | Very Knowledgeable | | | | | |
| Overall Mean | 3.01 | Knowledgeable | | 3.86 | Very Knowledgeable | | | | | |

Overall, there is an increase in the level of Critical Literature Pedagogy knowledge of Pre-service English Teachers with $M$ = 2.87 (Knowledgeable) prior to the introduction of CLP to $M$ = 3.73 (Very Knowledgeable) after introduction to CLP. The difference is statistically significant with a $p$-value of .001 at α = .05, and the null hypothesis is rejected as shown in Table 6.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 6**
*Overall Level of CLP Knowledge of pre-service English language teachers*

| Samples | *t* | *df* | *p* | *MD* | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| Overall Pre-test | 38.379 | 68 | .001 | 2.870 | 2.721 | 3.02 |
| Overall Post-test | 85.748 | 68 | .001 | 3.734 | 3.647 | 3.82 |

The improvement in the level of knowledge of the participants contributed to their knowledge in the teaching and assessment of literature, as shown in the qualitative data collected. More specifically, the succeeding section illustrates the influence of Critical Literature Pedagogy on Content and Pedagogical Knowledge in the teaching and assessment of literature.

*Principles for Teaching Literature*

Results of principal component analysis and varimax with Kaiser normalization as rotation method rendered four components extracted from the data on pre-service English teachers' knowledge after exposure to CLP. Prior to the implementation of factor analysis, KMO and Bartlett's Test were conducted to check for sampling adequacy. Results indicate a *KMO* of .723 or good (Naseer et al., 2019) and *p*-value of .001 for Bartlett's Test of Sphericity as shown in Table 7.

**Table 7**
*Kaiser-Meyer-Olkin and Bartlett's Test Results*

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | Bartlett's Test of Sphericity | | |
|---|---|---|---|
| | Approx. Chi-square | *df* | *p*-value |
| .723 | 1.86.630 | 171 | .001 |

Additionally, Figure 1 shows that there are four components with an eigenvalue that is higher than one, while Table 8 shows the domains of CLP that factor-loaded together into four different components that may serve as guiding principles for delivering literature lessons.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Figure 1**
*Scree plot of the Results of Principal Component Analysis*

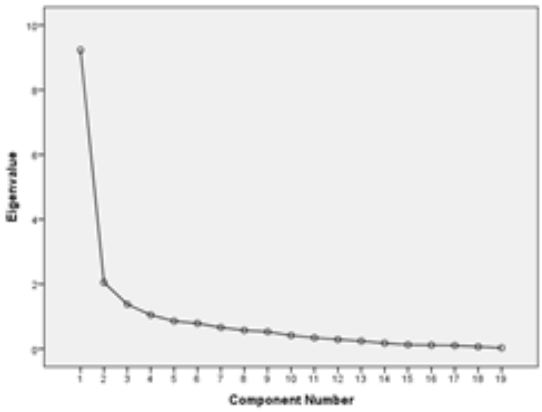


**Table 8**
*Results of Principal Component Analysis – Rotated Component Matrix*

| Indicators | Communalities | | Component | | | |
|---|---|---|---|---|---|---|
| | Initial | Extraction | 1 | 2 | 3 | 4 |
| Canonicity 1 | 1.000 | .757 | .200 | .156 | .140 | .820 |
| Canonicity 2 | 1.000 | .717 | .728 | .091 | .359 | .224 |
| Canonicity 3 | 1.000 | .684 | .495 | .009 | .496 | .439 |
| Canonicity 4 | 1.000 | .815 | .274 | .015 | .169 | .843 |
| Context 1 | 1.000 | .667 | .017 | .521 | .592 | .210 |
| Context 2 | 1.000 | .631 | .098 | .649 | .256 | .368 |
| Context 3 | 1.000 | .745 | .217 | .198 | .709 | .395 |
| Context 4 | 1.000 | .619 | .562 | .261 | .470 | .117 |
| Context 5 | 1.000 | .663 | .435 | .048 | .628 | .278 |
| Literary Element 1 | 1.000 | .643 | .265 | .307 | .680 | .123 |
| Literary Element 2 | 1.000 | .639 | .650 | .284 | .367 | -.006 |
| Literary Element 3 | 1.000 | .543 | .453 | .323 | .266 | .403 |
| Reader Response 1 | 1.000 | .808 | .534 | .718 | .084 | -.012 |
| Reader Response 2 | 1.000 | .690 | .435 | .346 | .607 | -.110 |
| Reader Response 3 | 1.000 | .845 | .090 | .846 | .347 | -.026 |
| Reader Response 4 | 1.000 | .852 | .246 | .880 | .080 | .099 |
| Reader Response 5 | 1.000 | .764 | .789 | .129 | .261 | .238 |
| Assessment 1 | 1.000 | .866 | .856 | .184 | .152 | .274 |
| Assessment 2 | 1.000 | .758 | .812 | .171 | .063 | .255 |

Component 1 includes CLP domains assessment, reader, canonicity, and literary elements. Specifically, *Assessment item 1: Literature assessment must go beyond the classroom and delve into real-life solutions to problems and issues in society,* had the highest factor-loading of 0.856. Other CLP domains which factor-loaded in Component 1 include *Assessment item 2: Literature influences students to ask how they can affect change based upon their critical learning* (0.812),

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


*Reader item 5: Critical understandings of issues enable readers to connect them to similar issues relevant to other contexts* (0.789)*, Canonicity item 2: Literature reinforces cultural values, dominant ideologies and social norms* (0.728), and *Literary element item 2: Literature has themes that reinforce dominant ideologies about topics like class, achievement, sexual orientation, etc.* (0.65). Based on the features of these domains, the overarching principle for Component 1 that literature teachers must keep in mind is that *Literature is a medium for critical social engagement and ideological reflection.*

Likewise, Component 2 includes the CLP domains reader and context. Specifically, *Reader item 4: Students from privileged backgrounds may be hindered in questioning dominant ideologies because they often remain invisible to individuals in privileged positions,* had the highest factor-loading of 0.880. Other CLP domains which factor-loaded with Component 2 include *Reader item 3: Students from privileged backgrounds may be inhibited in identifying dominant ideologies because they often remain invisible to individuals in privileged positions* (0.846), *Reader item 1: Literature must go beyond striking a chord and resonating with students' experiences* (0.718), and *Context item 2: Literature reinforces dominant narratives* (0.649). Based on the characteristics of the domains which factor-loaded for this component, the overarching principle for Component 2 that may be used to guide the teaching of literature is that *Dominant ideologies embedded in literature must be recognized and challenged.*

Similarly, Component 3 includes CLP domains context, literary elements, and the reader. Specifically, *Context item 3: Literature must interrupt the dominant narratives about issues that are relevant to society* had the highest factor-loading of 0.709. Other CLP domains which factor-loaded with Component 3 include *Literary element item 1: Literature has characters from marginalized populations which play a secondary role in the plot of a novel, in support of a culturally dominant main character and hero* (0.68), *Context item 5: Literature must represent individuals from marginalized populations* (0.628), and *Reader item 2: Literature must promote students' engagements with power and difference* (0.607). The theme drawn from these domains forms the guiding principles for Component 3: *Literature must promote inclusivity and empower students to challenge dominant narratives.*

Finally, Component 4 is made up of the canonicity domain, with *item 4: Literature may privilege some voices and marginalize others*, having the higher factor-loading of 0.843, while *item 1: Literature is not ideologically neutral* has a factor-loading of 0.820. The theme arising from Component 4 is that literature teachers must recognize that *Literature is not neutral and may both privilege and marginalize voices.*

### *Influence of Critical Literature Pedagogy on Content and Pedagogical Knowledge*

The participants evaluated themselves to have had a significant improvement in their content knowledge in teaching and assessment of literature, most evident in two specific themes – Intellectual and Socio-cultural.

As shown in Figure 2a, under the Intellectual theme, the following sub-themes were captured: (1) Focus on higher order thinking skills, (2) Promotion of Critical Thinking, (3) Building/ Fostering Critical Literacy, and (4) Preventing/ Being aware of Indoctrination. On the other hand, under Socio-cultural theme, four sub-themes were also culled from the participants, and these include: (1) Increased awareness and understanding of social issues, (2) Challenging norms, biases, and stereotypes, (3) Increased empathy and understanding of diversity, and (4) Empowerment to engage and understand power dynamics.

Likewise, in terms of the influence of CLP on the Pedagogical Knowledge of participants in teaching and assessment of literature, as shown in Figure 2b, two major themes were evident. Inside the classroom, participants recognized the significance of using (1) differentiated teaching approaches, the importance of (2) inclusive learning environments, using (3) authentic tasks

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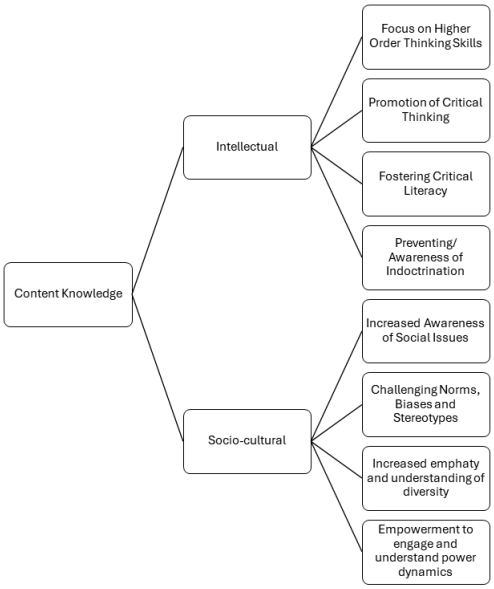
PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025

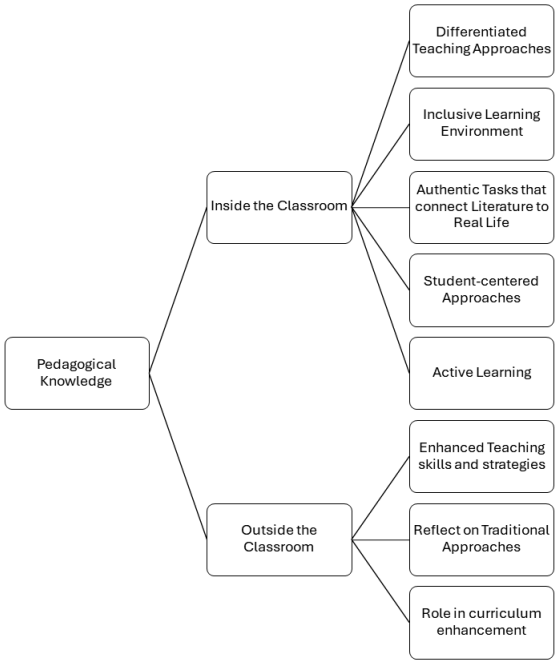

that connect literature to real life, (4) student-centered approaches, and (5) encouraging active learning. Furthermore, outside of the classroom, participants feel that they have (1) enhanced teaching skills and strategies, they can (2) reflect on traditional approaches they use, and their (3) role in curriculum enhancement.

**Figure 2**

*(a) Influence of CLP on Teaching and Assessment of Literature Content Knowledge*


Content Knowledge
Intellectual
Focus on Higher Order Thinking Skills
Promotion of Critical Thinking
Fostering Critical Literacy
Preventing/ Awareness of Indoctrination
Socio-cultural
Increased Awareness of Social Issues
Challenging Norms, Biases and Stereotypes
Increased emphaty and understanding of diversity
Empowerment to engage and understand power dynamics

*(b) Influence of CLP on Teaching and Assessment of Literature Pedagogical Knowledge*

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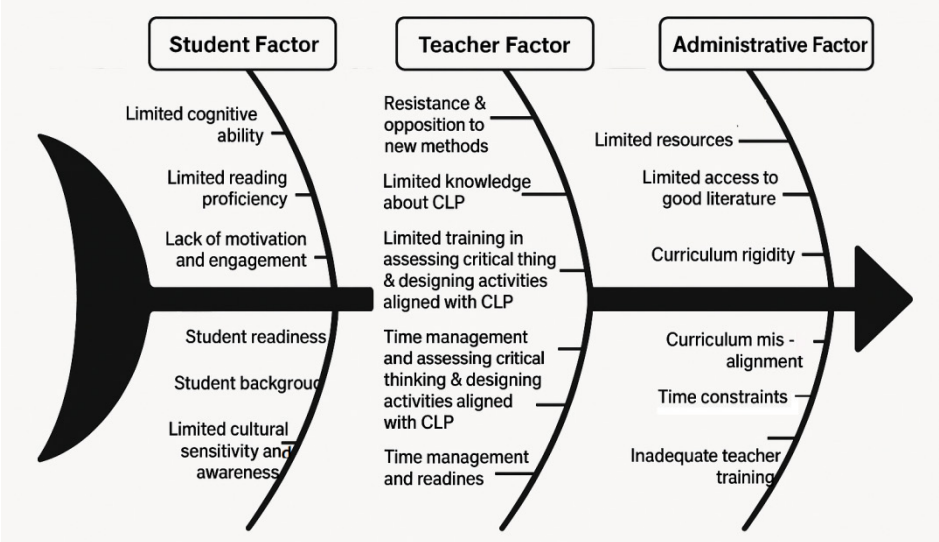
PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Despite these positive influences, the participants also recognized that there are several challenges in the use of CLP as an approach to teaching and assessment of literature. These challenges and how they may be addressed are tackled in the succeeding sections.

### *Challenges in the Implementation of CLP in Teaching and Assessment of Literature and Strategies to Address these*

Three main themes emerged in terms of the challenges participants encountered in the use of CLP in teaching and assessment of literature, and these involve (1) Student Factor, (2) Teacher Factor, and (3) Administrative Factor, as shown in Figure 3.

**Figure 3**
*Challenges in the Implementation of Critical Literature Pedagogy*


Student Factor
Limited cognitive ability
Limited reading proficiency
Lack of motivation and engagement
Student readiness
Student backgrou
Limited cultural sensitivity and awareness
Teacher Factor
Resistance & opposition to new methods
Limited knowledge about CLP
Limited training in assessing critical thing & designing activities aligned with CLP
Time management and assessing critical thinking & designing activities aligned with CLP
Time management and readines
Administrative Factor
Limited resources
Limited access to good literature
Curriculum rigidity
Curriculum mis - alignment
Time constraints
Inadequate teacher training

More specifically, challenges concerning Student Factor include limited cognitive ability, limited reading proficiency, lack of motivation and engagement, student readiness, student background, and limited cultural sensitivity and awareness. According to *participant 11*:

*"Students' cognitive abilities: When they use CLP to analyze and critique literature, they find it challenging because it calls for them to understand the text in a way that goes beyond its literal meaning and ask questions about why it was chosen for this particular context and how literary elements were used."*

In terms of Teacher Factor, challenges include resistance and opposition to new and unfamiliar methods of teaching and assessment of literature, limited knowledge of CLP, limited training in the art of questioning, limited training in assessing critical thinking and designing activities aligned with CLP, limited cultural sensitivity and awareness and time management and readiness. In fact, *participant 8* indicated that:

*"One of the major problems is that not everyone is ready to bend and break something that they have believed and accepted for years. Many students or even teachers would resist going against literature that they were accustomed to for some reason."*

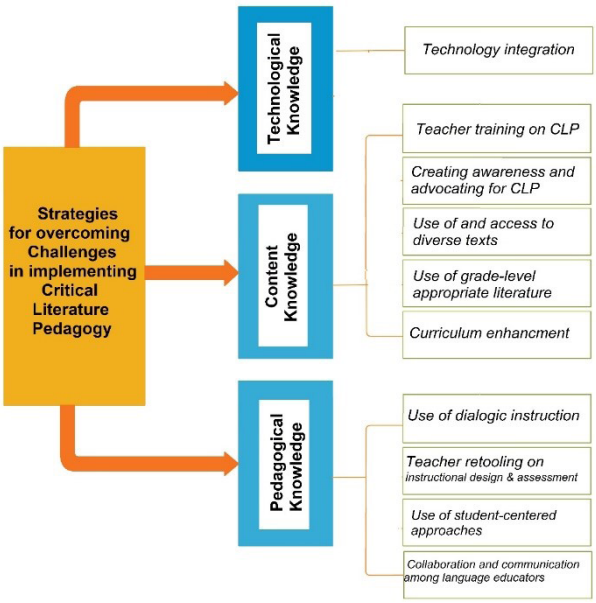
PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Lastly, challenges involving the Administrative Factor include limited resources, limited access to good literature, curriculum rigidity, curriculum misalignment, time constraints, and inadequate teacher training. For instance, *participant 6* indicated that:

*"Lack of time and resources, in public school nowadays, they allot 50mins in every subject and this short period of time cannot hold a meaningful discussion. Secondly, the materials, we have a lot of good authors but none of their work is included in DEPED material."*

To address the challenges identified, the following strategies may be implemented as shown in Figure 4.

**Figure 4**
*Solution Tree Map for Overcoming Challenges in Implementing CLP*


Strategies for overcoming Challenges in implementing Critical Literature Pedagogy
Technological Knowledge
Content Knowledge
Pedagogical Knowledge
Technology integration
Teacher training on CLP
Creating awareness and advocating for CLP
Use of and access to diverse texts
Use of grade-level appropriate literature
Curriculum enhancment
Use of dialogic instruction
Teacher retooling on instructional design & assessment
Use of student-centered approaches
Collaboration and communication among language educators

Strategies to overcome the challenges in the implementation of Critical Language Pedagogy in the teaching and assessment of literature involve three themes – Pedagogical Knowledge, Content Knowledge, and Technological Knowledge.

In terms of Pedagogical Knowledge, subthemes involve: (1) use of dialogic instruction, (2) teacher retooling on instructional design and assessment, (3) use of student-centered approaches, and (4) collaboration and communication among language educators. For example, *participant 9* stated that:

*"Encouraging students to openly express their ideas and perspectives to provide a safe space for analytical discussion and analysis. This will help to foster an open and diverse learning environment in the classroom."*

Likewise, Content Knowledge was identified as a major theme in addressing the challenges of CLP implementation. Subthemes involve: (1) teacher training on CLP, (2) creating awareness and advocating for CLP, (3) use of and access to diverse text, (4) use of grade-level appropriate text, and (5) curriculum enhancement. According to *participant 7*:

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


*"As future educators, we should be the ones suggesting quality content and realizing that some great materials are not being explored because no one has ever tried them. There exists a diverse literature selection that we could begin exploring if only we were brave enough to challenge the norms. We can collaborate in advocating for curriculum revision."*

Lastly, the third theme deals with Technological Knowledge, iterating the importance of technology integration in using CLP in teaching and assessment of literature. For instance, *participant 26* states that:

*"One way to address the problem of lack of learning materials is to embrace technology. The use of online resources such as digital libraries, open-access literary journals, and educational websites that provide a variety of texts and activities aligned with CLP principles."*

Ultimately, the implementation of CLP in teaching and assessment of literature has its challenges, but these do not take away from the effectiveness of the approach in developing critical literacy among students. Literature teachers can utilize strategies to address the challenges identified so that students will not just become knowledgeable but also become active agents of change in society.

## Discussion

The results suggest that pre-service English language teachers perceive themselves to already be knowledgeable in terms of recognizing the capacity of "*Literature to reinforce cultural values, dominant ideologies, and social norms",* as it received the highest self-evaluation mean prior to the introduction of CLP. However, the participants affirmed that they have become more knowledgeable, especially in relation to the idea that "*Literature is not ideologically neutral*," with a mean increase of 0.92. This means that they have become more aware of the language used in literature that carries with them the belief system and ideologies of the author that may or may not have been intentionally transmitted to the students. Likewise, the idea of "*Literature privileging some voices and marginalizing others"* was also well understood with a mean increase of 0.85, showing that participants have acquired the sensitivity to identify how literature promotes dominant groups and fails to lend a voice for other marginalized sectors. Increasing awareness of this feature can translate to a more ethical and socially responsive selection of literary text to be introduced to the class. This aligns with the works of Agdeppa and Metila (2017), Baladi (2007), and Freire (1970), emphasizing that issues about power and social justice must be addressed in literacy programs and literature. Furthermore, the smaller standard deviation after the intervention illustrates that the group of participants have become more homogeneous in their knowledge of the CLP domain – Canonicity. This is significant as it means that the majority of the pre-service teachers have become Very Knowledgeable, thoughtful, and sensitive in selecting and deciding on the literary text to be tackled in class, through CLP.

The results also illustrate that pre-service English language teachers perceive themselves to already be knowledgeable in terms of recognizing how *"Literature must represent individuals from marginalized groups"* even before introduction to CLP. The feature that participants considered themselves least knowledgeable of involves seeking how *"Literature must be able to interrupt dominant narratives about issues relevant to society."* This may mean that although the participants were aware of how literature is used to reflect the experiences of the oppressed and marginalized members of the community, they still have limited critical literacy to unpack the dominant and normative ideas intentionally or unintentionally transmitted in the literature. However, this lack of critical literacy was enhanced significantly from $M = 2.59$ to $M = 3.70$,

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


a mean increase of 1.11. This means that the participants have become more discriminating in winnowing the dominant and normative ideas embedded or even hidden in the literary text, affirming claims that issues of cultural politics evident in literature must be confronted by challenging students' perceptions and experiences (Darder et. al., 2003).

Another salient improvement was the increased knowledge of *"Literature including counter-stories that make dominant ideologies visible."* This is significant as it encapsulates the capacity to verify ideas, especially from non-fiction literature, counter check the narratives, check the credibility of the source of information, and listen to counter-stories. These literary evaluation skills are themselves 21st century skills that will enable students to be able to grasp the accurateness of information available to them, especially in the ever-busy digital world filled with misinformation, disinformation, and mal-information. The ability to critically analyze literature and recognize the dominant ideologies embedded in them is important because political, cultural, social, and moral ideologies are transmitted through them (Hall, 2005).

Prior to the intervention, the participants considered themselves least knowledgeable about the significance of how *"Language choice and literary devices used in literature are not neutral",* with the mean evaluation of 2.57. However, after introduction to the CLP domain Literary Elements, there was a sharp increase in their level of knowledge with a mean evaluation of 3.73, a 1.16-point difference. It demonstrates that the participants have become more intentional readers, analytic and critical of the language used in the literary text, and the literary devices chosen by the author. Beyond the New Criticism, which only looks at how the literary elements contribute to the interpretation or meaning making of the text, through CLP, an understanding of the ideology behind the language choice is also scrutinized. Students learned to *decode,* that is, they find the actual, hidden meaning of things (Freire, 1970). This is necessary as students must not just tackle the use of literary devices in isolation but instead utilize language to tackle issues in society and eventually participate in efforts to solve these issues (Agdeppa & Metila, 2017).

The most significant improvement in terms of CLP Reader domain was the participants' increased knowledge of how *"Students from privileged backgrounds may be hindered in questioning dominant ideologies because they often remain invisible to individuals in privileged positions"* with a $M$ = 2.67 (Knowledgeable) before the intervention to $M$ = 3.59 (Very Knowledgeable) after the introduction of CLP. Such awareness shall enable the teacher to utilize strategies that will ensure that students think more critically and develop critical consciousness, which will help them not just improve their own life conditions but take necessary actions to build a more just and equitable society (Aliakbari & Fajari, 2011). Likewise, a marked improvement in the pre-service English language teachers' knowledge about *"Literature promoting students' engagement with power and difference"* was evident, with a $M$ = 2.75 (Knowledgeable) before the intervention to $M$ = 3.51 (Very Knowledgeable) after the introduction of CLP. This means that the pre-service teachers were aware of the significance of literature in humanizing, empowering, and transforming students from being objects of literary education to subjects with their own autonomy and emancipation (Aliakbari & Fajari, 2011). Prior to the intervention, the participants utilized traditional assessment strategies that only focus on lower order thinking skills, such as memorization and remembering, or analysis and reflection about the literature in class. Although there was knowledge about *"Literature assessment beyond the classroom and delving into real-life solutions to problems and issues in society"* and *"Literature's influence on students' capacity to affect change based on their critical learning,"* such activities were seldom applied as literature assessments in the classroom. The significant increase in the level of knowledge about CLP-based assessment practices shows that the teacher-participants can now challenge their students to not just react to literature but be creators that explore their identity, examine principles of social justice, and promote acceptance of diversity (Giacomelli, 2012). Using CLP-based assessment, students not just interpret or find meanings in literature, but also create a meaning or seek out several alternative meanings (Burbules & Burk, 1999).

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Ultimately, based on the results, the study proposes the following principles that may guide teaching and assessment of literature: Principle 1: Literature is a medium for critical social engagement and ideological reflection; Principle 2: Dominant ideologies embedded in literature must be recognized and challenged; Principle 3: Literature must promote inclusivity and empower students to challenge dominant narratives; and Principle 4: Literature is not neutral and may both privilege and marginalize voices. Incorporating these principles into literature teaching and assessment enables educators to more effectively address the challenges of globalization while fostering a more comprehensive approach to learning (Ignacio & Paras, 2025).

## Conclusions and Implications

This study emphasizes the transformative potential of implementing Critical Literature Pedagogy (CLP) in literature teaching and assessment to enhance students' critical literacy. By encouraging learners to engage with literature beyond the confines of the classroom and recognize its relevance to their lived realities, CLP fosters deeper, more meaningful learning experiences. Key findings reveal that authentic tasks, collaborative activities, and assessments focused on real-life problem-solving embedded in literature significantly improve students' critical literacy and agency.

To address the identified research gap, this study contributes to the growing body of evidence supporting CLP as an effective methodology for empowering students to critically analyze texts and societal structures. It is recommended that CLP be integrated as a foundational component of pre-service English Language Teaching programs, either as a specialized topic or a dedicated course. Additionally, continuous professional development for educators on CLP methodologies is essential, alongside the creation of learning materials aligned with CLP principles. Training administrative personnel to design schedules conducive to CLP implementation further ensures its success.

The findings also suggest incorporating CLP principles into pre-service teacher observation tools to promote consistent application throughout teacher education programs. Future research should explore the applicability of CLP across other disciplines, such as Filipino pre-service teachers, Early Childhood Education, and Elementary Education, to validate or expand upon these results. By bridging theoretical insights with practical applications, this study underscores CLP's role in fostering critical thinking and social awareness in educational contexts.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


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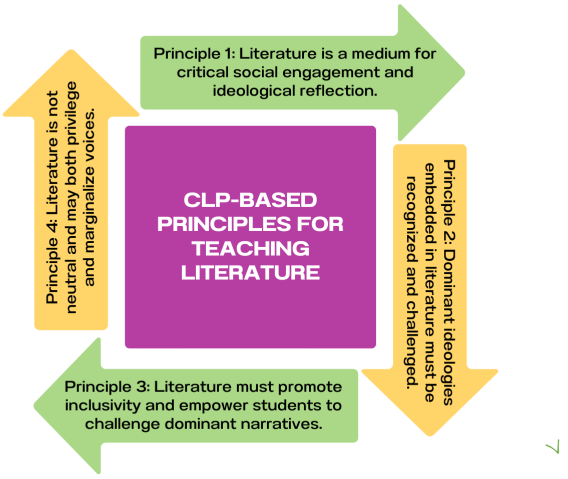
PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Appendix A**

*Proposed Critical Literature Pedagogy-based Principles for Teaching Literature*


Principle 1: Literature is a medium for critical social engagement and ideological reflection.
Principle 2: Dominant ideologies embedded in literature must be recognized and challenged.
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CLP-BASED PRINCIPLES FOR TEACHING LITERATURE

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025
218

# PREDICTORS OF CONCEPT FORMATION AND EDUCATIONAL CONTEXTUALIZATION COMPETENCIES IN GEOMETRY OF PRE-SERVICE MATHEMATICS TEACHERS

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## Abstract

*As an interdisciplinary and multicultural educational framework takes the centrality of the delivery of 21st-century education across all levels, this study attempts to address the competencies that prospective and neophyte teachers need to possess to effectively design contextualized education. Through stepwise multiple regression analysis, mathematical communication and mathematical reasoning skills were explored as potential predictors of both concept formation and educational contextualization abilities of 114 randomly selected pre-service mathematics teachers (PMTs) enrolled in their last term of teacher education training in eight Teacher Education Institutions (TEIs) in Panay Island of Western Visayas, Philippines. Results placed the PMTs at the initial stage of developing proficiency in all these competencies, implying learning gaps and skills development deficiencies. Analysis revealed that mathematical communication significantly predicted the concept formation performance, while concept formation ability was likewise a significant predictor of educational contextualization competence. Findings entail that prospective mathematics teachers who demonstrate effective mathematical communication skills also embody profound sense-making and knowledge formation abilities, which in turn contribute to their capability in designing contextualized mathematics education. In enabling policies on curricular directions among TEIs, the study findings offer vantage perspectives towards integrative teaching approaches that curriculum planners and educators may introduce in teacher education training of PMTs.*
**Keywords:** *mathematics education, integrative teaching, pre-service teacher education, contextualizing geometry education, mathematical communication, mathematical reasoning*

## Introduction

The integrative educational framework that spans interdisciplinary and multicultural pedagogical approaches in almost all levels of education requires appropriate teaching techniques and proficient academic personnel to translate instruction into tangible learning. Studies have shown that the specific teaching strategies these approaches entail were found effective in facilitating authentic learning. However, there remain less explored areas on what skillset aspiring teachers need to acquire and demonstrate to meet the pedagogical requirement of delivering contextualized and integrative education (Moely & Connoly, 2020; Roslan et al., 2023). Integrative teaching approaches are strategized by situating the educative process in meaningful contexts; generating operational knowledge through conceptualizing and applying knowledge through problem-centering (Nikitina, 2006). Educational contextualization is founded on the idea that learning is an outcome of employing appropriate contexts in the teaching process (Edwards, 2009). It is a process that situates teaching and learning materials and processes into the interplay of culture, time, and personal experience as a form of humanization of knowledge. This allows the faculty and students make connections among disciplines, personal and practical issues; develops learner agency in learning; and fosters

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


motivation among learners to know, understand, and appreciate cultural heritage (Benneth et al., 2007; Gebre & Polman, 2020). Consequently, contextualization provides dynamic relationship and continuity between the students' schooling experience and everyday life where students' everyday knowledge become cultural and learning resources (Giljie & Erstad, 2017) in order to achieve conditions for effective learning characterized by deeper conceptual understanding, active student engagement, and skills transfer; hence, achieving higher academic achievements, student retention and progression to advanced studies (Perin, 2011).

Contextualization at the teaching-learning level rests on pedagogical competence of teachers in designing integrative learning experience. This entails continued professional development for in-service teachers and a review of policies and practices in pre-service teacher education programs. At the pre-service stage, there is a need to underscore the role of contextualization as a pedagogical content knowledge to be taught and as a teaching strategy to be employed in learning content at the pre-service training stage.

Concerned with how future mathematics teachers were prepared globally, the International Association for the Evaluation of Educational Achievement (IEA) began in 2007-2008 a comprehensive study to investigate and understand worldwide teacher education training in terms of what beginning mathematics teachers know and can do and how national policies in countries contribute to pre-service teacher education outcomes (Tatto et al., 2008, Tatto, 2020). The study measured content knowledge (CK) and pedagogical content knowledge (PCK) of PMTs in 21 countries. The study observed that future teachers with deeper mathematical understanding were more capable of interpreting students' thinking and making appropriate response (Tatto et al., 2012). This shows that PMTs with profound knowledge of content have better chances of effectively teaching the content. Hence, establishing provisions towards sufficient cognitive development and the inclusion of interdisciplinary and multicultural teaching approaches in the curriculum may guarantee an effective training of future mathematics teachers.

### *Contextualization in Mathematics Education*

Mathematics in education can be viewed as a cultural construction that draws from familiar contexts - experiences, environments and processes the development of cognitive and problem-solving strategies, and achievement of substantial sense-making and knowledge formation (Chavarria-Arroyo & Albanse, 2023; Mallart et al., 2018). Contextualization in education began towards the later part of the 20th century, spanning more than three decades of inquiry and practice in education (Gilbert, 2006; Hofstein et al., 2011; Silzeth & Erstad, 2018). Studies on implementing contextualized education in mathematics and science education have shown its potential to affect learning across learning levels (Nashon & Anderson, 2013; Nilson & Ryve, 2014; Parr et al., 2008; Picardial & Sanchez, 2022; Valdez & Bungihan, 2019). Furthermore, contextualization through real mathematics education (RME) was found to enhance other higher order cognitive abilities such as mathematical reasoning and mathematical communication skills of students (Palinusa et al., 2021).

Despite consistent studies on the efficacy of contextualization in education, several gaps in theory and practice were noted. These include issues on identification of contexts and how they are appropriately framed in various learning environments; most contexts defined by teachers often limit student agency in the learning process (Gebre & Polman, 2020); development of assessment procedures that incorporate basic skills and content knowledge to determine the effects of contextualization; and the amount of contextualization to be integrated in a learning activity (Perin, 2011). In view of teacher education pre-service training, there is a lack of research that looked into how contextualization is integrated into the teacher education curriculum and the necessary cognitive skills that contribute to meaningful design of contextualized teaching procedures by future teachers. Hence, this study sought to establish an

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


anchor point for contextualized pre-service training in one of the content courses in mathematics education.

### *Concept Formation and Inquiry*

Concept formation is geared towards knowledge formation. It is a teaching-learning dimension that is viewed as an individual cognitive ability to operationalize ideas on the one hand, and as a teaching strategy on the other. Vygotsky's theory of concept formation provides a strong framework on the role of language in concept formation. According to Vygotsky (1986, p. 106), "It is a functional use of the word, or any other sign, as a means of focusing one's attention, selecting distinctive features and analyzing and synthesizing them, that plays a central role in concept formation."

As concepts are initially developed by individuals, words are used as both mediators and concept representations. The individual's interaction with the social world through communication enables him to reconcile his personal concept with that of the external world, thus, the developed concept becomes cognitively and socially constituted (Radford, 2000). As a learning ability, it involves higher-order mental processes on how individuals develop an empirical notion or operational knowledge through a sequence of cognitive processes (Pielsticker, 2021; Rao, 2006; Schunk, 2012) that include exploration, comparison, classification, generalization, and abstraction (see Marzano, 2000) as used in reasoning and inquiry.

As an integrative teaching strategy, concept formation is characterized as basic science. Thus, it is a scientific method-oriented approach and plays an essential role in mathematical investigation, discovery learning, and scientific inquiries (Nikitina 2006). Successful concept formation in inquiry requires that learning is an active process through exploration and development of empirical or operational concepts by formulating hypotheses, testing them, and connecting them to other fields of application (Burscheid & Struve, 2020; Pielsticker, 2021). Consequently, learners through inquiry achieve profound knowledge and understanding or cognitive gains, become engaged and motivated in the search for new knowledge, develop agency in learning, and transfer newly learned knowledge and skills to different contexts (Duran & Dokme, 2016; Eshetu et al., 2022; Laursen et al., 2014; Teig, 2021; Teig et al., 2018).

With the emphasis of 21st-century education on student-centered lifelong learning, educational systems now take inquiry as an essential component of curriculum delivery (Chu et al., 2017a, 2017b; Fuja & Asrizal, 2021; Preston et al., 2015). While decades of research and practice have shown the efficacy of discovery and inquiry-based learning approaches in achieving desired earning outcomes (Duran & Dokme, 2016; Jerrim et al., 2019; Teig, 2021) there are prevailing implementation challenges noted to include teachers' lack of experience and inadequate pedagogical content knowledge on inquiry-based teaching strategies, high time and resources requirements for schools and teachers, and the demand for students to do high level of independent learning (Moely & Connoly, 2020; Roslan et al., 2023). While inquiry has been widely acclaimed as a successful teaching approach mostly in science education, there remains enough room for its implementation in other areas such as mathematics and social sciences (Caswell & Derek, 2017; Moely & Connoly, 2020).

### *Mathematical Communication and Reasoning Skills*

Mathematics is a unique language made up of words, illustrations, tables, graphs, and symbols forming expressions and equations (Tong et al., 2021) that are embedded within another language as the medium (i.e., mathematics in English or mother tongue). To communicate mathematically is to use mathematical language in expressing mathematical ideas (Kamid et al., 2020). Thus, a hallmark of mathematics education is for learners to develop effective

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mathematical communication skills (Tong et al., 2021). Recent literature connects mathematical communication with other learning and cognitive abilities, teaching approaches, and the nature of learners. Tong et al. (2021) characterized mathematical communication as the ability to identify, understand and solve mathematical problems expressed in mathematical language; accurately and logically state, explain and prove mathematical concepts and specify applications of mathematical concepts. Mathematical communication skills are also enhanced through guided discovery and problem-based learning models among middle high school students (Supriyanto et al., 2020; Wandari & Fardillah, 2020; Supriyanto et al., 2020; Zulkarnain et al., 2021), contextualized instruction such as Realistic Mathematics Education (RME) (Andriani & Fauzan, 2019; Hutapea et al., 2019; Palinussa, 2021). As for cognitive style, communication skills vary between field-independent and field-dependent upper secondary learners (Kamid et al., 2020).

The characterization of mathematical communication skills by Tong (2021) suggests a more fundamental skill that is contained in the process of accurately and logically presenting, explaining and proving mathematical ideas—mathematical reasoning skill. This skill is demonstrated when students explain their notions, make comparisons and inferences, justify deductions and decisions, and apply and transfer learning from one context to another (Australian Curriculum, 2013; Mata-Pereira et al., 2017). With the centrality of mathematical reasoning in mathematics learning, an enhanced mathematical reasoning is essential towards achieving mathematical fluency, particularly in the understanding of mathematical concepts and their applications in various contexts (Mukuka et al., 2023). However, Mukuka et al. (2019) showed that mathematical reasoning among pre-service teachers is a less developed ability, where they demonstrated limited conceptual understanding of mathematical proof. Similarly, there is evidence of discrepancy between the in-service teachers' claims on supporting reasoning skills development and the actual learning opportunities they provide to promote communication and reasoning skills (Mukuka et al. 2021). As such, falling short on optimizing the provision of relevant learning experience reflects the need for pre-service and in-service teachers to be equipped with appropriate teaching strategies that promote higher order cognitive skills such as mathematical reasoning and mathematical communication.

### *Research Aim*

This study looked into the learning achievements of PMTs in mathematical communication and mathematical reasoning and how these competencies influence their operationalization of mathematical concepts and utilization of contextualization in teaching. The assumptions of constructivism and socio-cognitive learning theory, which posit that learning is constructed by students through social contexts (Schunk, 2012), provide the theoretical framework for the study. Consequently, the pre-service teachers' cognitive and pedagogical abilities and how they utilize these abilities to facilitate the attainment of learning outcomes are assumed to reflect their pre-service teacher education experience. Hence, the pre-service teacher education curriculum has to provide relevant learning experience that addresses the development of cognitive and pedagogical capabilities of PMTs to answer the demands of their future workplace. In view of these concerns, the study sought to answer the following research questions:

1. What is the extent of mathematical communication, mathematical reasoning, concept formation, and educational contextualization competencies of PMTs?

2. Are there significant correlations among these competencies?

3. Which of the competencies are predictors of concept formation and educational contextualization skills of PMTS?

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


## Research Methodology

### *Design*

This quantitative research employed a cross-sectional survey-predictive correlational design intended to investigate the extent of development and relationships among the identified competencies of PMTs. According to Frankael et al. (2012), a cross-sectional survey gathers data through asking questions to members of a sample drawn from a predetermined population with the purpose of describing characteristics of the population from which the sample was drawn. In this study, data were gathered from randomly selected participants from a finite population of PMTs through researcher-developed instruments personally administered by the researcher. As predictive correlational research, which ascertains relationships between variables and predicts future outcomes without variable manipulation (Creswell & Creswell, 2017; Keith, 2019), this study utilized predictive correlation analysis to determine pairwise relationships among the competencies, and to identify significant predictors of concept formation and educational contextualization skills. Findings were interpreted within the assumptions of quantitative analysis and the theoretical framework of the study.

### *Sample*

A total of 114 graduating PMTs participated in the study. These PMTs were enrolled in eight TEIs in Panay Island of the Western Visayas region in the Philippines. As they were in the last term of their teacher education training, they were deployed as practice teachers in basic education schools in compliance with the 360-hour teaching internship requirement. During data collection, the respondents were in their last month of their internship; hence, they had tangible experience of supervised actual classroom teaching.

The sample size was calculated from the population of 161 PMTs in the same year level using Cochran's formula at margin of error $e = .05$ and population percentage $p = .5$. With three predictor variables, this sample size sufficed for the required minimum of 15 participants per predictor set by Stevens (1996) for multiple regression analysis in social sciences or the criteria $N > 50 + 8m$ where $N$ is the total sample size and m is the number of predictors by Tabachnik and Fidell (2007). Stratified sampling was used to proportionally allocate the respondents to their TEIs, and simple random sampling was then used to select PMTs from their respective institutions. Table 1 below shows the distribution of the respondents by institution and gender. The highest number of participants was 30(26.32%) coming from two TEIs, while the least number was 3(2.63%). Notably, about 7 out of 10 participants in the study were female. They were between 21 and 22 years old. The participation of PMTs in the study, including those in the pilot testing of instruments, was voluntary, with each executing informed consent.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 1**
*Distribution of Respondents by Institution and Gender*

| Sociodemographic characteristic | *n* | % |
|---|---|---|
| **Institution** | | |
| Teacher Education Institution 1 | 30 | 26.32 |
| Teacher Education Institution 2 | 3 | 2.63 |
| Teacher Education Institution 3 | 30 | 26.32 |
| Teacher Education Institution 4 | 4 | 3.51 |
| Teacher Education Institution 5 | 21 | 18.42 |
| Teacher Education Institution 6 | 7 | 6.14 |
| Teacher Education Institution 7 | 13 | 11.40 |
| Teacher Education Institution 8 | 6 | 5.26 |
| **Gender** | | |
| Male | 46 | 30.35 |
| Female | 68 | 69.65 |

*Instruments and Procedures*

The study utilized four sets of validated and pilot-tested researcher-developed instruments described in the following sections. Content and form validation was conducted by five experts in mathematics education who were actively engaged in pre-service mathematics teacher education training in their respective TEIs. These educators have doctoral degrees in mathematics education. After validation and revisions, the final drafts were pilot-tested on 25 PMTs enrolled in the university where the author was affiliated. Scoring rubrics were developed and subjected to validation along with the competency tests. The test-retest method in the pilot testing was used with a one-week interval between the testing periods. The reliability of each instrument was determined by correlating the two sets of scores using Pearson's *r*. With the obtained correlation coefficients greater than .70, the developed instruments were considered to have an acceptable degree of reliability: mathematical communication ($r = .895$), reasoning skills ($r = .895$), concept formation ($r = .939$), and contextualizing instruction ($r = .890$).

*Mathematical Communication Skills Test*. In designing the research instrument to assess mathematical communication skills, the researcher adapted the constructs characterizing mathematical communication as familiarity with symbols representing mathematical ideas and awareness of the syntactic rules for writing symbols in acceptable form (Bergqvist & Lithner, 2012); accurate and logical presentation, illustration, and proof mathematical ideas (Tong et al., 2021) drawn from adequate mathematical vocabulary (Rustam & Ramlan, 2017). The developed instrument consisted of 35 items to measure the ability of the respondents in written English language in the context of mathematics, particularly on verbal ability - appropriate use of mathematical term or expression to express an idea clearly in formal written communication (10), vocabulary - meaning of a mathematical term, expression or notation (10), identifying and correcting errors in mathematical statements (8), and reading comprehension and proof organization (7). One (1) point is assigned to every correct answer.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


*Mathematical Reasoning Skills Test.* The development of this research instrument is based on the concepts that mathematical reasoning is a higher order ability that is both deductive and logical (Jader et al., 2017; Mata-Pereira et al., 2017), and a chain of premises or deductions that learners adopt to draw a conclusion when completing a mathematics activity which may be both deductive and inductive (Lithner, 2008). Guided by these constructs, the research instrument consisted of 10 mathematical-logical situations that required students to apply mathematical inductive reasoning (3), mathematical deductive reasoning (3), and general logical reasoning (4). A 5-point analytic rubric was used to score responses.

*Concept Formation Skills Test.* A 10-item research instrument consisting of mathematical situations intended for guided inquiry was used to measure the ability of PSMTs to formulate concepts in geometry. The framework for the development of the instrument is based on the characterization of concept formation in terms of the thinking skills that include (Marzano, 2000): systematic exploration through comparing, classifying, organizing; logical analysis and abstraction, and mathematical concept formation. A 5-point rubric was used to score responses in each of these aspects of conceptualization.

*Instructional Contextualization Competence Test.* This instrument assessed the ability of PMTs to associate a mathematical concept to different contexts, formulate a contextualized learning activity, and specify a contextualized assessment strategy in assessing learning. The framework used in the development of this instrument is based on the classification of contexts identified by Metz (2013). The resulting instrument consisted of three parts: relating concepts to contexts (4), contextualizing instruction procedures (4), and contextualizing assessments (4). A 5-point rubric was used to evaluate the responses of the PMTs in each of the items.

The instruments were administered by the researcher in two separate sessions in each of the participating TEIs. The instruments on mathematical communication and mathematical reasoning were administered as verbal tests on the first session with one hour allocation for each test. The assessment of concept formation and educational contextualization skills was done in the second session and was administered through a workshop setting with a two-hour allocation for each test. Before the workshop, an orientation session was conducted by the researcher to set the direction in answering the instruments.

### *Data Analysis*

To describe the performance of PMTs in each of the assessed competencies, the mean, standard deviation and percentage score were used. The percentage score is the ratio, expressed in percent, of the mean score to the highest possible score in an item or component of a test. In open-ended tests, rubrics were used to score responses. Content analysis was also used to identify learning gaps and skills development deficiencies in each of the items. A scheme using mean percentage score (MPS) was used to interpret the extent of performance of PMTs and identify learning gaps. It includes: Below 50 (Beginning level), 50.00 – 62.50 (Developing), 62.51 – 75.00 (Approaching Proficiency), 75.01 – 87.50 (Proficient), 87.51 – 100.00 (Advanced).

Analyses of correlations and predictive relationships utilized Pearson's $r$ and stepwise multiple regression analysis at 5% significance level, respectively. To ensure that standards of inferential analysis were observed, normality tests were performed to check on the initial assumptions of parametric correlation analysis. Kolmogorov-Smirnov test results shown in Table 2 indicate that data in each variable are normally distributed ($p > .05$).

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 2**
*Kolmogorov-Smirnov Normality Tests on the Distribution of Data in Each Study Variable*

| Study variables | Statistic | *df* | *p* |
|---|---|---|---|
| Mathematical communication | .070 | 114 | .200 |
| Mathematical reasoning | .079 | 114 | .078 |
| Concept formation | .067 | 114 | .200 |
| Educational contextualization | .066 | 114 | .200 |

## Research Results

*Extent of Competencies of PMTs*

The descriptive analysis of mathematical communication skills of PMTs used mean, standard deviation, and mean percentage score. Results shown in Table 3 indicate that the skills development in this competence was at the beginning level ($M$ = 13.49, $SD$ = 4.42, $MPS$ = 38.54). Content analysis of responses revealed that PMTs manifested a developing level of ability on reading comprehension and proof organization and needed substantial improvement on identifying and correcting errors, verbal ability and mathematics vocabulary. The PMTs appeared to have difficulty in distinguishing expressions that represent equalities and inequalities in statements and graphs; and no clear distinction on the correct use of *always*, *sometimes*, *never* in plane and space contexts. These learning gaps in mathematics vocabulary were due to unfamiliarity with and inability to comprehend the technical terms in mathematics such as function, undefined, uniqueness, and existence; unfamiliarity with meanings and conditions of symbols like the quantifier ∀ … ∃, parallelism //, similarity ∼, congruence ≅, divisibility |. In identifying and correcting errors, PMTs showed limited ability in formulating structurally correct and adequate definitions, theorems, and postulates to correct an erroneously framed statement. In terms of reading comprehension and proof organization, future teachers had difficulty in organizing statements to form valid arguments in writing proofs and in applying and analyzing ideas in a reading selection.

**Table 3**
*Extent of Mathematical Communication Skills of PMTs*

| Mathematical communication skills | Score | *M* | *SD* | Mean percentage score |
|---|---|---|---|---|
| Verbal ability | 10 | 3.88 | 1.81 | 38.80 |
| Mathematics vocabulary | 10 | 3.85 | 1.82 | 38.50 |
| Identifying and correcting errors | 8 | 1.52 | 1.23 | 19.00 |
| Reading comprehension and proof organization | 7 | 2.14 | 1.56 | 26.75 |
| Total | 35 | 13.49 | 4.42 | 38.54 |

*Note*: MPS interpretation is based on the scale: Below 50.00 (Beginning), 50.00 – 62.50 (Developing), 62.51 – 75.00 (Approaching Proficiency), 75.01 – 87.50 (Proficient), 87.51 – 100.00 (Advanced).

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


The assessment of reasoning skills involved three components, two of which are explicitly mathematical in context: mathematical inductive reasoning which uses specific cases to form a generalization involving mathematical concepts and operation; mathematical deductive reasoning which applies general mathematics principle or concept to a specific case of application; and general logical reasoning which employs semantics, logical thinking or a combination of inductive and deductive reasoning in familiar situations. The overall extent of reasoning skills of PMTs shown in Table 4 was at the beginning level ($M$ = 15.23, $SD$ = 2.58, $MPS$ = 30.46). Their skill in each of the three forms of reasoning was also at the beginning level with deductive reasoning as the least developed, followed by logical reasoning, and then deductive reasoning. Analysis of the responses identified the learning gaps behind low-level performance. In mathematical inductive reasoning, PMTs manifested difficulty in identifying and abstracting patterns into coherent statements as conclusions. In mathematical deductive reasoning, there was an inability to recall and translate appropriate mathematical principles into specific cases; and in non-mathematical logical reasoning, the PMTs had difficulty in applying negation and truth values, making correspondence through elimination, and analyzing semantic clues in arguments.

**Table 4**
*Extent of Mathematical Reasoning Skills of PMTs*

| Reasoning skills | Score | *M* | *SD* | Mean percentage score |
|---|---|---|---|---|
| Mathematical inductive reasoning | 15 | 7.09 | 2.47 | 47.27 |
| Mathematical deductive reasoning | 15 | 2.67 | 1.25 | 17.8 |
| General logical reasoning | 20 | 5.58 | 2.53 | 27.90 |
| Total | 50 | 15.23 | 2.58 | 30.46 |

*Note*. MPS interpretation is based on the scale: Below 50.00 (Beginning), 50.00 – 62.50 (Developing), 62.51 – 75.00 (Approaching Proficiency), 75.01 – 87.50 (Proficient), 87.51 – 100.00 (Advanced).

The assessment of concept formation performance involved three aspects that include exploration, abstraction, and concept formulation. Using the mean, standard deviation and mean percentage score, the extent of skill development was analyzed and interpreted. Results show that the PMTs were at the beginning level of their concept formation ability ($M$ = 50.85, $SD$ = 21.67, $MPS$ = 33.90). As reflected in Table 5, their ability to do abstraction from specific cases was the least developed, followed by operational formulation of concepts and exploration of a given situation. Content analysis of the responses identified learning gaps in the concept formation ability of PMTs in terms of their inability in systematically exploring a mathematical situation as a starting point in conducting mathematical investigation. This then led to their difficulty in discovering and abstracting patterns, which consequently yielded erroneously framed concepts from investigation.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 5**
*Extent of Concept Formation Skills of PMTs*

| Concept formation skills | Score | *M* | *SD* | Mean percentage score |
|---|---|---|---|---|
| Exploration | 50 | 22.62 | 8.75 | 45.24 |
| Abstraction | 50 | 14.39 | 9.67 | 28.78 |
| Concept formulation | 50 | 20.88 | 9.39 | 41.76 |
| Total | 150 | 50.85 | 21.67 | 33.90 |

*Note*: MPS interpretation is based on the scale: Below 50.00 (Beginning), 50.00 – 62.50 (Developing), 62.51 – 75.00 (Approaching Proficiency), 75.01 – 87.50 (Proficient), 87.51 – 100.00 (Advanced).

In assessing educational contextualization, three aspects of educative process were considered: relating concept to context, contextualizing teaching procedure, and contextualizing assessment. Mean, standard deviation and mean percentage score were used to analyze and interpret the extent of skill achievement in contextualization. Reflected in Table 6, the extent of educational contextualization skill was at the beginning level ($M$ = 24.41, $SD$ = 9.41, $MPS$ = 32.55). Specifically, the least learned skill in contextualizing education was contextualizing assessment, followed by contextualizing teaching procedures and then relating concept to context. In analyzing responses, the PMTs were found to be less proficient in relating the given topics in geometry to familiar or real-life situations, fictional or contrived contexts, related topics in mathematics, and other fields of knowledge.

**Table 6**
*Extent of Educational Contextualization Competence of PMTs*

| Educational contextualization | Score | *M* | *SD* | Mean percentage score |
|---|---|---|---|---|
| Relating concept to context | 25 | 11.76 | 4.06 | 47.04 |
| Contextualizing teaching procedure | 25 | 6.74 | 4.32 | 26.96 |
| Contextualizing assessment | 25 | 5.91 | 4.10 | 23.64 |
| Total | 75 | 24.41 | 9.41 | 32.55 |

*Note*: MPS interpretation is based on the scale: Below 50.00 (Beginning), 50.00 – 62.50 (Developing), 62.51 – 75.00 (Approaching Proficiency), 75.01 – 87.50 (Proficient), 87.51 – 100.00 (Advanced)

*Correlations among Competencies of PMTs*

Results of pairwise correlation analyses involving the identified cognitive and pedagogical abilities of PMTs are reflected in Table 7. Findings showed highly significant, weak, and positive correlations between these variables: mathematical communication and reasoning skills ($r$ = .275), mathematical communication and educational contextualization competence ($r$ = .378), mathematical reasoning and concept formation skills (r = .295), mathematical reasoning and educational contextualization competence ($r$ = .262). This shows that while the relationship between the variables in each pair is consistent, the influence of one on the other is mostly minimal. Highly significant, moderate and positive correlations were noted between mathematical communication and concept formation skills ($r$ = .652), and concept formation and educational contextualization competence ($r$ = .479), suggesting the observable influence of one variable over the other. Furthermore, significant pairwise correlations between these variables indicate the interconnectedness among the identified

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025



higher order cognitive and contextualization abilities of PMTs. As a reference for regression analysis, the correlation coefficients also indicate no multicollinearity among the variables ($r < .70$) and identify potential predictors of concept formation and educational contextualization competencies ($r > .30$).

**Table 7**
*Correlations among the Identified Competencies of PMTs*

| Study variables | | Mathematical communication | Mathematical reasoning | Concept formation |
|---|---|---|---|---|
| Mathematical communication | r | 1.00 | | |
| | p | -- | | |
| Mathematical reasoning | r | .275 | | |
| | p | .002 | | |
| Concept formation | r | .652 | .295 | |
| | p | <.001 | .001 | |
| Educational contextualization | r | .378 | .262 | .479 |
| | p | <.001 | .002 | <.001 |

*Predictor of Concept Formation Skills*

A stepwise regression analysis was performed to determine significant predictors of the concept formation performance of PMTs. Results presented in Table 8 reveal a highly significant linear relationship between mathematical communication and concept formation skills, . Given the regression statistics in Table 9, the coefficient of determination indicates that mathematical communication accounts for 42.60 % of the variance in concept formation ability. The model yields the regression equation Concept Formation = 7.708 + 3.198 (Mathematical communication) highlighting the significant contribution of mathematical communication in the ability of PMTs to conceptualize mathematical ideas.

**Table 8**
*Analysis of Variance for Mathematical Communication against Concept Formation*

| ANOVA | *df* | *SS* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Regression | 1 | 22600.401 | 22600.401 | 83.035 | < .001 |
| Residual | 112 | 30484.163 | 272.180 | | |
| Total | 113 | 53084.564 | | | |

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 9**
*Stepwise Regression Result for Concept Formation*

| Variable | *B* | 95% CI for B | | *SE B* | *β* | $R^2$ | $\Delta R^2$ |
|---|---|---|---|---|---|---|---|
| | | LL | UL | | | | |
| Model 1 | | | | | | .426 | .426 |
| Constant | 7.708 | -2.158 | 17.575 | 4.98 | | | |
| Mathematical communication | 3.198*** | 2.502 | 3.893 | .351 | .652 | | |

*Note*: CI = Class Interval; LL = Lower Limit; UL = Upper Limit
***$p < .001$

*Predictor of Educational Contextualization Competence*

To determine significant predictors of educational contextualization competence among concept formation, mathematical communication and reasoning skills, a stepwise multiple regression analysis was used. Results in Table 10 identify concept formation as a significant predictor of educational contextualization competence . The highly significant linear correlation between the two variables affirms the consistency of influence between the two variables. The regression statistics presented in Table 11 indicate that with , about 22.90 % of the variance in the educational contextualization ability of PMTs is due to their concept formation skills. The *B* coefficients give the regression model Educational contextualization = 13.848 + 0.208 (Concept formation), which suggests significant and positive contribution of the ability of PMTs to conceptualize mathematical ideas to their competence in the delivery of contextualized mathematics education.

**Table 10**
*Analysis of Variance for Concept Formation against Educational Contextualization*

| ANOVA | *df* | *SS* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Regression | 1 | 2292.173 | 2292.173 | 33.308 | < .001 |
| Residual | 112 | 7707.500 | 68.817 | | |
| Total | 113 | 9999.673 | | | |

**Table 11**
*Stepwise Regression Result for Educational Contextualization*

| Variable | *B* | 95% CI for B | | *SE B* | *β* | $R^2$ | $\Delta R^2$ |
|---|---|---|---|---|---|---|---|
| | | LL | UL | | | | |
| Model 1 | | | | | | .229 | .229 |
| Constant | 13.848*** | 9.908 | 17.789 | 4.98 | | | |
| Concept formation | .208*** | .136 | .279 | .036 | .479 | | |

*Note*: CI = Class Interval; LL = Lower Limit; UL = Upper Limit
***$p < .001$

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


## Discussion

Analyses of the extent of skills development in mathematical communication, mathematical reasoning, concept formation, and educational contextualization of PMTs revealed learning achievements below expectations. The consistent beginning level of abilities of PMTs in these competencies signifies performance that barely reaches the minimum or fundamental level and points out problematic learning and skills development. The assessment of mathematical communication skills revealed a considerable degree of difficulty of PMTs in applying requisite cognitive strategies, such as analyzing the specific use of technical language of mathematics and comprehension in ascertaining the accuracy of a statement on a mathematical concept or principle. In this study, it can be noted that the English language used as a medium for teaching and learning of mathematics was a second language among PMTs. As mathematics itself is a language of its own, non-native speakers of the medium may experience two aspects of language barriers which counter learning acquisition and transfer. Since language facility is integral in mathematics learning (Bailey et al., 2016; Kleemans & Segers, 2020; Sigley & Wilkinson, 2015; Vukovic & Lesaux, 2013), focused treatment on language structure and vocabulary, as well as on the oral and written form of language expression is imperative in doing mathematics for PMTs.

The low-level achievement of mathematical reasoning skills in the areas of inductive, deductive and general logical reasoning affirms the inability of PMTs to navigate from specific to general cases of reasoning and vice versa, and to apply mathematical logic to an implicitly framed mathematical situation. This finding verifies similar research findings revealing that students' reasoning ability was imitative and routinary, often experienced in traditional teaching settings (Sukirawan et al., 2018) and inadequately developed on making deductions, assessing argument validation, and formulating the generalization (Mukuka, 2021; Novianda & Prabawanto, 2021).

The deficiency in the development of concept formation skills of PMTs is reflected in their inability to generalize patterns and relationships obtained from exploration of mathematical situations, and to operationally formulate concepts in coherent mathematical language. Previous studies noted that the preservice teachers' understandings of geometry and measurement had not fully developed as evidenced by unproductive concept images, concept definitions, and lacking ability to present clearly their reasoning with geometric concepts. They found that the level of their understanding was comparable to that of primary graders or secondary school students (Browning et al., 2014).

The study findings on educational contextualization skills of PMTs point out learning gaps in connecting concepts to contexts, outlining contextualized learning activity and designing contextualized assessment strategy for a given topic. It is of common knowledge that teachers teach the way they are taught (Oleson & Hora, 2014); thus, this performance in contextualizing education may reflect the decontextualized teaching of mathematics practiced in teacher education institutions. When pre-service teachers are devoid of relevant contexts, they may accumulate isolated knowledge that operates only within mathematics. Consequently, students develop limited ability to remember ideas and knowledge that are divorced from meaningful contexts (Wang et al. 2022; Wotherspoon et al., 2015).

The significant correlations among mathematical communication, mathematical reasoning, concept formation and educational contextualization skills of PMTs imply the interconnectedness of these competences and the nonlinear progression of learning and skills development that TEIs may consider in implementing contextualized education. For instance, reasoning as the main feature of mathematics, cannot be separated from the activity of learning to include concept formation through inquiry and mathematical investigations. The consistent association between reasoning skills and concept formation verified in the study also echoes

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


earlier studies showing that reasoning and the ability to formulate generalizations are closely linked. Basically, correlation existed between scientific reasoning skills and mathematics achievement (Căprioară, 2015; Frosch & Simms, 2015; Hasanah et al., 2019; Tajudin & Chinnappan, 2015). Likewise, students who experienced difficulty in recognizing general statements also struggled in creating them as they were dependent on examples or specific cases to justify the truth of a statement (Stylianides & Stylianides, 2017; Sukirawan et al., 2018).

The predictive relationship between mathematical communication and concept formation highlights that the ability to operationally formulate mathematical knowledge stems from a profound comprehension of mathematical concepts and a command of mathematical language. Since concept formation is phenomenological (Hefendehl-Hebeker, 2016), mathematics learning becomes an empirical and object-oriented experience where contents and concepts learned are drawn by students from manipulation of tangible familiar objects in their respective meaningful realities (Pielsticker; 2021). This bridges concept formation and contextualization skills.

With concept formation skill as a significant predictor of educational contextualization ability, an increase in the level of ability in concept formation may produce a significant improvement in the ability of teachers to connect the teaching and learning of geometry across disciplines and other relevant contexts. This is because PMTs during concept formation connect their mathematical knowledge to the curriculum and pedagogy as the relevant and meaningful contexts (Buchbinder & McCrone, 2020; Burscheid & Struve, 2020; Pielsticker, 2021). The enhanced knowledge base developed then becomes contextualized and may present varied and relevant learning pathways that teachers may employ to address persistent drawbacks in mathematics teaching and learning (Xueli et al., 2022). However, it was noted that some PMTs entered mathematics training program with limited knowledge and experience to anchor mathematical concepts, their overall mathematical knowledge was limited and weak, and their prior abilities were focused primarily on manipulation of formulas. These findings, along with the study results, underscore the need for PMTs to have greater exposure to problems and learning experiences that promote conceptual understanding (Browning et al., 2014). The task for TEIs then is to initiate the PMTs into professional practice through which they are expected to embody what their future workplace requires, and to critically assess the interplay of content, cognitive and pedagogical competencies in teacher education curriculum.

## Conclusions and Recommendations

The results of this study give credence to the reported development deficiencies in higher order cognitive abilities, and pedagogical competencies of pre-service and neophyte in-service mathematics teachers. It provides evidence on direct and consistent associations among mathematical communication, mathematical reasoning, concept formation, and instructional competencies of prospective teachers. This interplay of skills suggests that learning progression in both content and pedagogical knowledge entails integrative non-linear approaches in teacher education pre-service curriculum. Mathematical communication and reasoning are overarching skills that need to develop along with concept formation and educational contextualization skills of PMTs through contexts drawn from knowledge base and real-life experience in which these skills operate.

The research findings provide empirical data that may inform educators and curriculum planners in designing and implementing relevant pre-service training curricular content and pedagogy, and in crafting policies that detail integrative educational framework.

The study identifies some limitations that may open up future research directions. The study covered a limited number of participants from pilot testing to actual conduct of competency testing to generate substantial data that facilitate rigorous quantitative analysis and in-depth

review of research instruments. This is due to fewer college students taking mathematics in teacher education programs offered by colleges and universities within the region where the study was conducted.

As the present study was limited to the quantitative exploration of predictive relationships among the identified variables, a more structured related study employing additional variables and corresponding quantitative and qualitative analyses may be carried out to investigate the causality and paths of relationships.

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# DIGITIZING EDUCATIONAL RESOURCES: DEVELOPMENT OF LEARNING MATERIALS REPOSITORY HUB

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## Abstract

*This study developed a Learning Materials Repository Hub (LMRH) to digitize educational resources for the K-12 education system, addressing the need for centralized, high-quality, and accessible learning materials. Using a developmental research approach, Graduate School students created Digitized Learning Materials (DLMs) aligned with the Most Essential Learning Competencies (MELCs) and the Alternative Delivery Mode Learning Resource (ADMLR) standards of the Department of Education (DepEd). These materials were reviewed by subject-matter experts and integrated into the LMRH, which was designed as a centralized platform for organizing and sharing digital learning content. The study employed expert evaluations and teacher assessments to determine the content quality, educational effectiveness, technical usability, and overall acceptability of the LMRH. The Technology Acceptance Model (TAM) was used to measure perceived usefulness, ease of use, attitude toward using, and intention to use, while the System Usability Scale (SUS) evaluated its usability. Findings revealed that the DLMs received high ratings for quality, and the LMRH was deemed effective in supporting both synchronous and asynchronous learning. Teachers strongly agreed on its usefulness and ease of integration into teaching. The results suggest that digital learning repositories can significantly enhance teaching and learning experiences, providing a flexible and efficient platform for educators. The study highlights the importance of digitized educational resources and encourages further investment in educational technology to improve curriculum implementation and educational delivery in K-12 education.*

**Keywords:** *Learning Materials Repository Hub (LMRH), Digitized Learning Materials (DLM), Alternative Delivery Mode Learning Resource (ADMLR), Technology Acceptance Model (TAM), System Usability Scale (SUS)*

## Introduction

The COVID-19 pandemic has undeniably transformed education on a global scale, marking a permanent shift in how learning is delivered, accessed, and perceived. Traditional face-to-face education had to quickly adapt to online and hybrid models, accelerating the integration of technology into teaching and learning. Thus, COVID-19 pandemic has changed education forever (Li et al., 2020). Getting used to the New Normal education setup challenges school administrators, teachers, and students. The school administrators develop a continuity plan to prepare and properly implement educational programs. No program could have prepared teachers to teach in a pandemic (Torres, 2020). Teachers have to learn new strategies that they have never imagined before. They have to attend webinars that equip them to face a great educational shift. The students and their parents have doubts about their capacity to continue learning amidst the challenges of the pandemic in different aspects of their lives.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


The Department of Education (DepEd), the government agency responsible for managing and regulating the country's basic education system, introduced "Blended Learning" as a pre-existing method to shift the delivery of education in a new normal set-up. Blended learning is a method that uses radio, television, online, and modular learning to deliver lessons to students (Department of Education, 2017). Different learning delivery options such as face-to-face, blended learning, distance learning, homeschooling, and other delivery approaches shall be implemented (Müller et al., 2023). Teachers' Preparation, especially online, takes a huge amount of time. One of the preparations of teachers is the development of educational materials. DepEd offers self-learning modules (SLMs) alongside alternative learning delivery modalities to cater to diverse learners across the Philippines (Department of Education, 2017a). Bates (2019) stated that a well-designed learning experience is characterized by clear learning objectives, well-structured content, balanced workloads for both faculty and students, effective integration of media, meaningful student activities, and assessments that align closely with the intended learning outcomes. These SLMs were created by the public school teachers following the standard of Alternative Delivery Mode Learning Resource of DepEd.

SLMs are being used to cater to the needs of the students who prefer to have printed modules in learning. Partial results from the Learner Enrollment and Survey Forms (LESFs) collected during the enrollment period indicate that 7.2 million students opted for modular distance learning, TV and radio-based education, and other modalities, whereas only 2 million preferred online learning for the 2020-2021 school year (Hernando-Malipot, 2020). It is a reality that not all students claim that they don't have access to the internet; some students prefer to use online learning to access the materials and learn, which is also part of blended learning.

Several studies have identified a key challenge: instructors are transferring their traditional teaching methods to online learning, which does not seem to be effective (Leuțanu, 2021). Therefore, the issue is that online teaching methods and online faculty training services should be looked at differently, considering innovative techniques to facilitate quality education for students (Lipschuetz, 2017). The Department of Education introduced the DepEd Commons to the public schools through the Office of the Undersecretary of Administration Memorandum No. 4019 on April 7, 2021. DepEd Commons is a digital platform designed to assist public school teachers in facilitating distance learning. Slide presentations, tests, e-books, and instructive videos are all available on the site. One particular observation on the DepEd Commons is using the Quizizz application for most of its assessments. The researchers' proposed study is far more advanced than simply using an application for assessment. Pear Deck combines an interactive slide presentation with an assessment in the proposed study.

Pear Deck is another online application that can be an add-on to Google Slide. With the features of Pear Deck, teachers can make an interactive presentation that can be used in synchronous and asynchronous sessions. The initiative of the researchers to create additional resources that can make students learn better in the new normal provides options for teachers to choose other forms of learning resources. This is the key reason this research needs to be pursued, as K-12 teachers are supported in addressing the current normal educational set-up.

The content of the learning materials that were developed in this study was based on the Most Essential Learning Competencies (MELCs) of DepEd. All developed learning materials were subjected to the acceptability evaluation.

### *Research Problem*

In the evolving landscape of K-12 education, the integration of digital learning resources has become increasingly essential, particularly in blended and remote learning environments. However, a persistent challenge exists in ensuring that educational materials are centralized,

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


accessible, and aligned with national educational standards. Many teachers struggle with scattered, inconsistent, or low-quality digital resources, making it difficult to provide effective, engaging, and standardized education. The lack of a structured repository for digitized learning materials limits their ability to efficiently adapt to both synchronous and asynchronous teaching modes.

This study addresses this critical issue by developing a Learning Materials Repository Hub (LMRH) designed to centralize and organize high-quality digitized learning materials (DLMs). The primary problem lies in the absence of a unified platform that meets the Alternative Delivery Mode Learning Resource (ADMLR) standards set by the Department of Education (DepEd). This gap has scientific and pedagogical implications, as it affects educational effectiveness, curriculum implementation, and digital resource sustainability. By evaluating the usability, accessibility, and acceptability of the LMRH, this research seeks to contribute to the broader discourse on digital pedagogy and inform future developments in technology-driven education.

### *Research Focus*

The research focused on the development of a Learning Materials Repository Hub (LMRH) to serve as a centralized digital platform for curating and managing digitized learning materials (DLMs) for K-12 education. It emphasized the digitization and organization of educational resources to enhance accessibility for teachers and students, ensuring alignment with the Most Essential Learning Competencies (MELCs) and the Alternative Delivery Mode Learning Resource (ADMLR) standards set by the Department of Education (DepEd). Additionally, the study explored the integration of educational technology, particularly Google Slides with Pear Deck, to facilitate interactive and engaging learning experiences. The evaluation of DLMs was conducted through expert assessments, measuring their content quality, educational design, technical aspects, and structural organization. Moreover, the research examined the usability and acceptability of the LMRH by employing the Technology Acceptance Model (TAM) and the System Usability Scale (SUS) to analyze teachers' perceptions of its effectiveness. By addressing these key areas, the study aimed to enhance digital educational material repositories and provide practical solutions for improving the implementation of online and blended learning in the K-12 education system.

### *Research Aim and Research Questions*

The LMRH was designed to enhance educational delivery by providing structured, accessible, and high-quality digital resources that support both synchronous and asynchronous learning. By integrating various online learning materials, the platform aimed to address the challenges teachers face in accessing and utilizing digital educational resources, particularly in blended learning environments.

Specifically, this study sought answers to the following questions:

1. What were the features of the Learning Materials Repository Hub (LMRH) that was developed?
2. What were the topics covered in the development of digitized learning materials (DLM) in terms of:

2.1 Grade Level
2.2 Subject
2.3 Unit Title
2.4 Lesson Title

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


3. How were the digitized learning materials and learning materials repository hub developed?
4. What was the evaluation DLM by the experts based on:
4.1 Content Quality
4.2 Educational Quality
4.3 Technical Quality
4.4 Other Findings
4.5 Integration of PearDeck
5. What was the level of acceptability of DLM as evaluated by the teachers based on:
5.1 Perceived Usefulness
5.2 Perceived Ease of Use
5.3 Attitude Toward Using
5.4 Intention to Use
6. What was the level of usability of the LMRH as evaluated by experts and teachers?

## Research Methodology

### *General Background*

The rapid shift to digital education, accelerated by the COVID-19 pandemic, has reshaped the landscape of teaching and learning. Educational institutions worldwide have had to adapt to blended and online learning models, highlighting the need for accessible, high-quality, and well-organized educational materials. In the Philippines, the Department of Education (DepEd) introduced *Blended Learning* as a method of instruction that integrates various modalities such as radio, television, online platforms, and printed modules to ensure continuous learning. However, despite these efforts, challenges persist in terms of the availability, organization, and accessibility of digital learning resources.

To address these challenges, this study focuses on the development of a *Learning Materials Repository Hub (LMRH)*—a centralized digital platform designed to digitize, store, and manage educational resources for K-12 educators and learners. The LMRH aims to bridge the gap between traditional and digital learning materials by providing an interactive and structured repository aligned with the *Most Essential Learning Competencies (MELCs)* and *Alternative Delivery Mode Learning Resource (ADMLR)* standards set by DepEd.

The demand for innovative digital learning platforms is further underscored by the challenges teachers face in educational material development. While DepEd provides *Self-Learning Modules (SLMs)*, there is still a need for a more interactive and accessible system that can support synchronous and asynchronous teaching. In response, this study incorporates *Google Slides* and *Pear Deck* as key tools for interactive content delivery, allowing for a more engaging learning experience.

By leveraging educational technology, the LMRH serves as an innovative solution for managing and disseminating digitized learning materials efficiently. This study evaluates the system's usability and acceptability using expert assessments and teacher feedback, employing frameworks such as the *Technology Acceptance Model (TAM)* and the *System Usability Scale (SUS)*. The research highlights the role of digital repositories in enhancing educational delivery, ensuring that teachers and students have access to high-quality educational resources anytime and anywhere. Through this initiative, the study contributes to the ongoing efforts of improving digital learning infrastructure, fostering innovation, and supporting educators in navigating the evolving educational landscape.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


### *Sample*

The study involved 74 Graduate School students enrolled in Computer Education during the first trimester of the 2022-2023 academic year at a state university in Bulacan, Philippines. As part of their coursework, these students were tasked with developing Digitized Learning Materials (DLMs), ensuring comprehensive coverage across various grade levels and subject areas. The participants were teachers handling different subjects, including seven Social Studies, 21 English, two Values Education, nine Filipino, 19 Mathematics, six Science, and 10 Technology and Livelihood Education. Their involvement in the study stemmed from their enrollment in the Computer Education course during the said semester, making them key contributors to the development of DLMs.

To ensure the quality and effectiveness of these materials, subject-matter experts, including DepEd teachers and IT specialists, conducted evaluations focusing on content quality, educational design, technical aspects, and usability. There were 10 experts who evaluated the paper based on the criteria for development of new non-print resources from the Department of Education (2009).

Additionally, a separate group of 30 teachers from the Department of Education, randomly selected from the participants, assessed the acceptability and usability of the Learning Materials Repository Hub (LMRH) to determine its effectiveness in the teaching-learning process.

### *Instrument and Procedures*

The study employed a developmental research approach to design, evaluate, and validate the Learning Materials Repository Hub (LMRH) and its Digitized Learning Materials (DLMs). To assess content validity, educational quality, and technical accuracy, the *Evaluation and Review Criteria for New Non-PRINT Resources* from the Department of Education (2009) was utilized. Additionally, the *Checklist for Designing and Using Visuals in the Classroom* from the British Columbia Institute of Technology (2010) was employed to evaluate the content, design, and technical quality of the DLMs, ensuring alignment with educational and visual standards. Following the initial evaluation, 72 materials were endorsed for review by a panel of 10 teachers from the Department of Education, each with at least three years of teaching experience in their respective subjects. The distribution of materials among the evaluators was as follows: nine materials for Technology and Livelihood Education, 17 for Mathematics (evaluated by two teachers), nine for Filipino, eight for Social Studies, six for Science, 21 for English (evaluated by three teachers), and two for Values Education. This structured evaluation process ensured a thorough review of the DLMs, aligning them with subject-specific pedagogical and technical standards.

To determine the usability and acceptability of the LMRH, the study applied the Technology Acceptance Model (TAM) Questionnaire (Davis, 1989), which examined teachers' perceptions of perceived usefulness, ease of use, attitude toward using, and intention to use the platform. Furthermore, the System Usability Scale (SUS) (Sauro & Lewis, 2011) was used to assess the overall usability and functionality of the system.

The research followed a systematic procedure, beginning with the development of DLMs by Graduate School students enrolled in Computer Education. These students created interactive educational content using Google Slides with the Pear Deck extension, ensuring alignment with the Most Essential Learning Competencies (MELCs) and the Alternative Delivery Mode Learning Resource (ADMLR) standards set by DepEd. Once developed, the DLMs underwent expert evaluation for content accuracy, educational effectiveness, and technical quality, with DepEd specialists reviewing language and formatting before their integration into the repository.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


The subsequent phase focused on the design and development of the LMRH, establishing it as a centralized digital repository for storing, organizing, and accessing digitized educational materials, systematically categorized by grade level and subject. Following its development, usability and acceptability testing was conducted, where IT experts and teachers assessed the platform's navigation, functionality, and ease of use using the SUS and TAM evaluation tools.

The final phase involved system testing and implementation, ensuring that the LMRH was functional, efficient, and capable of supporting both blended and online learning modalities. These procedures ensured that the research effectively addressed the need for digitized educational resources, providing a sustainable and innovative digital learning solution for K-12 educators and learners.

### *Data Analysis*

The data analysis in this study employed descriptive statistics to evaluate the effectiveness, usability, and acceptability of the Learning Materials Repository Hub (LMRH) and its Digitized Learning Materials (DLMs). To assess the quality of the DLMs, mean scores and standard deviations were computed based on the evaluations of teachers and subject-matter experts. These assessments focused on key areas such as content quality, educational effectiveness, technical aspects, and structural organization, allowing the study to determine the strengths and areas for improvement in the educational materials.

To measure the usability of the LMRH, the study utilized the System Usability Scale (SUS) (Sauro & Lewis, 2011). The System Usability Scale (SUS), developed by Brooke (1986) and analyzed by Sauro & Lewis (2011), is a standardized tool for assessing system usability. It consists of 10 items rated on a five-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). To compute the SUS score, responses to odd-numbered items are adjusted by subtracting 1 from the given rating, while even-numbered items are adjusted by subtracting the rating from 5. The adjusted scores are then summed, resulting in a raw score between 0 and 40, which is multiplied by 2.5 to yield a final score ranging from 0 to 100. A score above 68 is considered above average, with 80.3 and higher indicating excellent usability, while scores below 50 suggest poor usability. This method provides a quick and reliable measure of a system's overall user experience. Higher SUS scores indicated better system performance and user experience, providing insights into the functionality, navigation, and overall user-friendliness of the platform. Evaluations were conducted by IT experts and teachers, ensuring that both technical and pedagogical perspectives were considered in determining the system's efficiency and usability.

Additionally, the Technology Acceptance Model (TAM) Questionnaire (Davis, 1989) was used to examine the acceptability of the LMRH and DLMs. The questionnaire measured perceived usefulness, evaluating whether the platform contributed to effective teaching and learning; perceived ease of use, assessing how intuitive and user-friendly the system was; attitude toward using, gauging teachers' overall sentiment and willingness to adopt the platform; and intention to use, determining the likelihood of continued or future utilization of the LMRH in educational settings.

To ensure the reliability and validity of the research instruments and collected data, a systematic approach was employed throughout the study. The research instruments, including usability and acceptability assessment tools, underwent content validation by a panel of subject-matter experts, IT specialists, and experienced educators. These experts evaluated the instruments based on clarity, relevance, and alignment with the research objectives before their administration. Additionally, the System Usability Scale (SUS) and Technology Acceptance Model (TAM) questionnaire were adapted from validated sources to ensure their construct validity in assessing user perceptions of the Learning Materials Repository Hub (LMRH).

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Through these analyses, the study provided valuable insights into the effectiveness, usability, and practical application of the LMRH. The findings highlighted the repository's potential to enhance educational delivery, support blended and online learning, and serve as a sustainable digital learning solution for K-12 educators. Based on the results, the study proposed recommendations for improving digital educational resources and optimizing the repository's usability for future educational applications.

## Research Results

### *Features of the Learning Materials Repository Hub (LMRH)*

The Learning Materials Repository Hub (LMRH) system serves as a central platform for accessing, sharing, and managing educational resources. Here are the key features typically found in this system:

The learning platform encompasses a comprehensive suite of features tailored to enhance user experience and ensure the integrity of the educational environment. It begins with robust user registration and authentication capabilities, facilitating the creation of accounts and ensuring secure identity verification through mechanisms like username/password, email verification, or social media login. Content upload and management functionalities empower registered users to contribute diverse learning materials, including documents, presentations, and PDF files, while tools for categorization, tagging, and metadata assignment streamline resource organization. A powerful search and browse functionality enables swift access to relevant materials, complemented by user profiles where individuals can manage personal information, preferences, and saved resources, as well as track learning progress and receive personalized recommendations. The platform prioritizes accessibility and inclusivity, adhering to standards like WCAG to ensure usability for users with disabilities, integrating features like alternative text for images and keyboard navigation. Analytics and reporting tools offer insights into usage metrics, user engagement, and content popularity, while content moderation and quality control mechanisms maintain the platform's integrity through review, approval, and management of user-contributed materials, alongside ensuring compliance with content guidelines and copyright regulations. Finally, stringent security and privacy measures, including encryption, secure authentication, and data access controls, safeguard user data and maintain confidentiality across the platform.

These features collectively enhance the functionality, usability, and value proposition of a Learning Materials Repository Hub system, providing a valuable resource for educators, learners, and other stakeholders in the education community.

### *Topics Covered in the Development of Digitized Learning Materials (DLM)*

The development of digitized learning materials (DLM) encompasses a wide array of topics across different grade levels and subjects. Each grade level, from elementary to high school, involves the creation of tailored educational content to meet the learning needs of students. Subjects such as English, Mathematics, Science, Filipino, Social Studies, and ICT are covered, with unit and lesson titles ranging from fundamental concepts like rhyming words and numerical comparison to more advanced topics such as intermolecular forces and contextual comprehension. Grade 1 subjects include English, Mathematics, Filipino, Social Studies, and Science. Lessons cover various topics such as rhyming words, numerical comparison, the story of Miss Cabbage, understanding family, and exploring the five senses. Grade 2 consists of English focusing on naming words, Filipino delving into the same story, Social Studies exploring community jobs, and Science distinguishing between living and non-living things.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Grade 3 comes with living and non-living things in Science, initial letters of object names in Filipino, and types of sentences in English. Grade 4 delves into livelihood programs in Social Studies, intermolecular forces and states of matter in Science, expressions conveying concepts or views in Filipino, and exploring personal identity in Values Education, with English focusing on nouns. Grade 5 contents have topics such as the story of Miss Cabbage in Filipino, physical properties of materials in Science, degree of comparison in English, and intermolecular forces and states of matter in Science. Grade 7 includes folktales serving as proof in Filipino, territorial issues in Social Studies, cause and effect in English, and angles formed by parallel lines cut by a transversal in Mathematics, along with intermolecular forces and states of matter in Science. Grade 8 has context clues in English, teaching listening in Filipino, and triangle congruence in Mathematics. Grade 9 consists into physical science and mechanical energy in Science, theorems on special parallelograms in Mathematics, focus of verbs in Filipino, comprehension skill and context clues in English, and patterns in the sky in Science. Grade 10 contents have plane coordinate geometry in Mathematics and distinguishing between real and make-believe facts and images in English. Additionally, Grade 11 has Introduction to Computing in ICT, while Grade 12 includes an in-depth study of intermolecular forces, liquids, and solids in Science.

*The Development of Digitized Learning Materials and Learning Resource Materials Hub*

The development of the Digitized Learning Materials (DLMs) and the Learning Materials Repository Hub (LMRH) followed a structured developmental research approach to ensure that the educational materials were pedagogically sound, interactive, and aligned with the Department of Education's (DepEd) standards. The process involved planning, design, development, validation, usability testing, and implementation, ensuring that the final repository effectively addressed the needs of teachers and students in a blended learning environment.

The first stage, planning and conceptualization, involved identifying key challenges in educational material development and the lack of centralized access to quality digitized resources. The study focused on developing DLMs aligned with the Most Essential Learning Competencies (MELCs) and Alternative Delivery Mode Learning Resource (ADMLR) standards. A comprehensive review of existing literature on digital learning repositories and educational design frameworks guided the project's development, ensuring that the materials were structured, relevant, and adaptable to various learning contexts.

In the development phase, Graduate School students enrolled in Computer Education were tasked with creating interactive digital learning materials for various grade levels and subjects. The process involved content selection, structuring, and designing digital formats using Google Slides integrated with Pear Deck to create interactive presentations. These materials featured embedded quizzes, multimedia elements, and real-time feedback mechanisms to enhance engagement. Once developed, the DLMs underwent content validation by subject-matter experts, who assessed their content accuracy, educational effectiveness, and technical usability before inclusion in the repository.

Following the completion of the DLMs, the development of the LMRH began as a centralized platform for storing, organizing, and sharing educational resources. The LMRH system design incorporated a user-friendly interface with categorized subjects and grade levels, search and filtering features for efficient material retrieval, and compatibility across multiple devices to support both online and offline learning. The repository structure aimed to provide an intuitive experience, enabling teachers to easily upload, access, and share resources while integrating interactive tools like Pear Deck to enhance content delivery.

To ensure the effectiveness of both the DLMs and LMRH, subject-matter experts, including DepEd teachers and IT specialists, conducted expert evaluations focusing on content validity, educational design, and technical quality. The findings confirmed that the DLMs met

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


high educational standards, while the LMRH was functional and accessible. However, areas for improvement were identified, particularly in subject-specific customization and content filtering to better cater to diverse teacher needs.

The next phase, usability testing and teacher assessment, involved gathering feedback from teachers and IT experts using the System Usability Scale (SUS) and the Technology Acceptance Model (TAM) questionnaire. The evaluation focused on key factors such as ease of use, system navigation, perceived usefulness, and integration with educational strategies. These assessments provided valuable insights into how effectively the Learning Materials Repository Hub (LMRH) supports digital educational resource management and its potential for widespread adoption in educational settings.

Following the validation and usability testing, the LMRH was implemented as a pilot digital repository for educators, allowing for real-world application and further evaluation. The study emphasized the importance of continuous refinement in digital education platforms to enhance their usability and effectiveness. Future improvements in the system include enhanced personalization features for subject-specific content, advanced search functionalities for more efficient resource retrieval, and the integration of learning analytics to track student engagement and optimize educational strategies. By addressing these areas, the LMRH can further support educators in digital learning environments, making educational resource management more efficient and accessible.

The development of DLMs and the LMRH followed a systematic, research-driven process, ensuring that the materials were high-quality, accessible, and effective in educational delivery. The iterative approach of design, evaluation, and refinement highlights the need for continuous innovation in digital education platforms. Moving forward, further system enhancements, AI-driven recommendations, and expanded teacher training will improve the platform's usability and long-term adoption in blended and online learning environments.

### *Evaluation of DLM by the Experts*

The Digitized Learning Materials (DLM) were evaluated by the experts in terms of the quality of content, text, graphics, colors, background, and inclusion of Pear Deck.

Table 1 presents the descriptive measures on the quality of the learning hub materials in terms of its content as perceived by the teachers.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 1**

*Descriptive Measures of Teachers' Perception on the Quality of the Learning Hub Materials According to Content*

| Items | *M* | *SD* | Descriptive Interpretation |
|---|---|---|---|
| 1. Content is consistent with topics/skills found in the DepED Learning Competencies for the subject and grade/year level it was intended. | 3.62 | 0.15 | Very Satisfactory |
| 2. Concepts developed contribute to enrichment, reinforcement, or mastery of the identified learning objectives. | 3.51 | 0.26 | Satisfactory |
| 3. Content is accurate. | 3.66 | 0.18 | Very Satisfactory |
| 4. Content is up-to-date. | 3.69 | 0.20 | Very Satisfactory |
| 5. Content is logically developed and organized. | 3.66 | 0.18 | Very Satisfactory |
| 6. Content is free from cultural, gender, racial, or ethnic bias. | 3.76 | 0.29 | Very Satisfactory |
| 7. Content stimulates and promotes critical thinking. | 3.62 | 0.15 | Very Satisfactory |
| 8. Content is relevant to real-life situations. | 3.55 | 0.39 | Satisfactory |
| 9. Language (including vocabulary) is appropriate to the target user level. | 3.65 | 0.42 | Very Satisfactory |
| 10. Content promotes positive values that support formative growth. | 3.69 | 0.20 | Very Satisfactory |
| Overall | 3.64 | 0.44 | Very Satisfactory |

The table presents descriptive measures of teachers' perceptions regarding the quality of learning hub materials based on different content criteria. The overall mean score for teachers' perception of the quality of the materials is 3.64, indicating a very satisfactory rating. The standard deviation *(SD)* of 0.44 suggests moderate variability in the perceptions among teachers. The highest mean score is observed for item 6, "Content is free from cultural, gender, racial, or ethnic bias," with a mean of 3.76, also classified as very satisfactory. On the other hand, the lowest mean score is for item 8, "Content is relevant to real-life situations," with a mean of 3.55, still classified as satisfactory.

The findings suggest that teachers generally perceive the learning hub materials positively, as indicated by the high mean scores across most criteria. However, there are areas, such as relevance to real-life situations, where there might be room for improvement or where perceptions vary more significantly among teachers. This analysis underscores the importance of continually assessing and refining educational materials to ensure they effectively meet the needs and expectations of educators and students.

Table 2 presents the descriptive measures on the quality of the learning hub materials in terms of its education as perceived by the teachers.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 2**
*Descriptive Measures of Experts' Perception on the Quality of the Learning Hub Materials According to Instruction*

| Items | *M* | *SD* | Descriptive Interpretation |
|---|---|---|---|
| 1. Purpose of the material is well defined. | 3.55 | 0.39 | Satisfactory |
| 2. Material achieves its defined purpose. | 3.58 | 0.38 | Very Satisfactory |
| 3. Learning objectives are clearly stated and measurable. | 3.31 | 0.45 | Satisfactory |
| 4. Level of difficulty is appropriate for the intended target user. | 3.68 | 0.43 | Very Satisfactory |
| 5. Graphics/colors/sounds are used for appropriate educational reasons. | 3.59 | 0.44 | Very Satisfactory |
| 6. Material is enjoyable, stimulating, challenging, and engaging. | 3.50 | 0.45 | Satisfactory |
| 7. Material effectively stimulates creativity of target user. | 3.57 | 0.44 | Satisfactory |
| 8. Feedback on target user's responses is effectively employed. | 3.66 | 0.39 | Very Satisfactory |
| 9. Target user can control the rate and sequence of presentation and review. | 3.69 | 0.20 | Very Satisfactory |
| 10. Instruction is integrated with target user's previous experience. | 3.47 | 0.42 | Satisfactory |
| Overall | 3.56 | 0.41 | Satisfactory |

Table 2 shows the experts' perceptions regarding the quality of learning hub materials based on educational criteria. The overall mean score for experts' perception of the quality of the materials is 3.56, categorizing it as satisfactory. The standard deviation (SD) of 0.41 indicates moderate variability in the perceptions among experts. Examining the individual items, the highest mean score is observed for item 9, "Target user can control the rate and sequence of presentation and review," with a mean of 3.69, classified as very satisfactory. Conversely, the lowest mean score is for item 3, "Learning objectives are clearly stated and measurable," with a mean of 3.31, which still falls within the satisfactory range. While the experts' perceptions indicate a satisfactory level of quality for the learning hub materials, there are specific areas, such as the clarity and measurability of learning objectives, where there may be room for improvement. The analysis underscores the importance of considering expert feedback in refining educational materials to ensure they effectively meet the intended learning objectives and engage the target audience.

Table 3 presents the descriptive measures on the quality of the learning hub materials in terms of its technicality as perceived by the teachers.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 3**

*Descriptive Measures of Experts' Perception on the Quality of the Learning Hub Materials According to Technicality*

| Items | *M* | *SD* | Descriptive Interpretation |
|---|---|---|---|
| 1. Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing. | 3.46 | 0.43 | Satisfactory |
| 2. Visual presentations are clear and easy to interpret. | 3.65 | 0.42 | Very Satisfactory |
| 3. Visuals sustain interest and do not distract the user's attention. | 3.55 | 0.41 | Satisfactory |
| 4. Visuals provide accurate representation of the concept discussed. | 3.54 | 0.41 | Satisfactory |
| 5. The design allows the target user to navigate freely through the material. | 3.73 | 0.36 | Very Satisfactory |
| 6. The material can easily and independently be used. | 3.72 | 0.37 | Very Satisfactory |
| 7. The material will run using minimum system requirements. | 3.82 | 0.29 | Very Satisfactory |
| 8. The material is free from technical problems. | 3.65 | 0.42 | Very Satisfactory |
| Overall | 3.64 | 0.42 | Very Satisfactory |

Table 3 outlines descriptive measures of experts' perceptions concerning the quality of learning hub materials with a focus on technical aspects. The overall mean score for the experts' perception of the materials' quality stands at 3.64, indicating a classification of "very satisfactory".

The standard deviation (*SD*) of 0.42 suggests a moderate level of variability in experts' opinions regarding technical aspects. Among the individual items, the highest mean score is attributed to item 7, "The material will run using minimum system requirements," with a mean of 3.82, also classified as very satisfactory. Conversely, the lowest mean score is for item 1, "Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing," with a mean of 3.46, falling within the satisfactory range.

The results suggest that experts perceive the technical quality of the learning hub materials positively, with most aspects rated as very satisfactory. However, there may be opportunities for improvement in certain areas, such as ensuring screen displays are aesthetically pleasing and easy to read, where opinions among experts vary more significantly. This analysis highlights the importance of addressing technical considerations to enhance the usability and effectiveness of educational materials.

Table 4 presents the descriptive measures on the quality of the learning hub materials in terms of the structure of the material as perceived by the teachers.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 4**
*Descriptive Measures of Experts' Perception on the Quality of the Learning Hub Materials According to the Structure of the Material*

| Items | *M* | *SD* | Descriptive Interpretation |
|---|---|---|---|
| 1. Conceptual errors. | 3.49 | 0.40 | Satisfactory |
| 2. Factual errors. | 3.64 | 0.15 | Very Satisfactory |
| 3. Grammatical and / or typographical errors. | 3.38 | 0.39 | Satisfactory |
| 4. Other errors (i.e., computational errors, obsolete information, errors in the visuals, etc.). | 3.54 | 0.42 | Satisfactory |
| Overall | 3.51 | 0.42 | Satisfactory |

Table 4 provides descriptive measures of experts' perceptions regarding the quality of learning hub materials, focusing on the structure of the material. The overall mean score for experts' perception of the materials' structural quality is 3.51, indicating a satisfactory level. The standard deviation (*SD*) of 0.42 suggests a moderate level of variability in experts' opinions regarding the structural aspects of the materials. Examining the individual items, the highest mean score is attributed to item 2, "Factual errors," with a mean of 3.64, classified as very satisfactory. Conversely, the lowest mean score is for item 3, "Grammatical and/or typographical errors," with a mean of 3.38, still within the satisfactory range.

The findings suggest that experts perceive the structural quality of the learning hub materials positively, with most aspects rated as satisfactory. However, there may be room for improvement in certain areas, such as minimizing grammatical and typographical errors, where opinions among experts vary more significantly. This analysis underscores the importance of meticulous editing and proofreading processes to enhance the structural integrity and credibility of educational materials.

*Level of Acceptability of DLM as Evaluated by the Teachers*

The level of acceptability of DLM was evaluated by thirty (30) teachers to assess its perceived usefulness, ease of use, attitude toward using, and intention to use in educational settings. Their evaluations were conducted using the *Technology Acceptance Model (TAM) Questionnaire*, which provided insights into how effectively the DLMs support teaching and learning. The results helped determine whether the digitized learning materials could enhance educational delivery and engagement in both synchronous and asynchronous learning environments.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


**Table 5**
*Level of acceptability of DLM as evaluated by the teachers in Perceived Usefulness*

| A. Perceived Usefulness | *M* | *SD* | Descriptive Interpretation |
|---|---|---|---|
| 1. Use of DLM using Google Slides and Pear Deck helps me to control the pedagogy. | 3.63 | 0.49 | Strongly Agree |
| 2. Use of DLM using Google Slides and Pear Deck enhances the teaching performance. | 3.74 | 0.45 | Strongly Agree |
| 3. I find the DLM using Google Slides and Pear Deck useful in my class. | 3.52 | 0.57 | Strongly Agree |
| 4. Use of DLM using Google Slides and Pear Deck makes it easier to catch individual students' needs. | 3.70 | 0.47 | Strongly Agree |
| Overall | 3.65 | 0.49 | Strongly Agree |

Table 5 indicates that teachers generally perceive Digital Learning Materials (DLM) implemented through Google Slides and Pear Deck as highly useful in their teaching practices, with an overall mean score of 3.65, falling within the "Strongly Agree" category. The highest mean score is for the statement "Use of DLM using Google Slides and Pear Deck enhances the teaching performance" with a mean of 3.74, indicating strong agreement among teachers regarding the positive impact of these tools on teaching effectiveness. Participants articulated that the integration of Pear Deck in their prospective classrooms empowers them to implement a range of effective teaching strategies and methodologies. Contrarywise, the lowest mean score is for the statement "I find the DLM using Google Slides and Pear Deck useful in my class" with a mean of 3.52; however, it still reflects a high level of agreement. The standard deviation across all items is relatively consistent, ranging from 0.45 to 0.57, indicating a moderate level of variability in responses. Overall, the data suggests that teachers highly value the perceived usefulness of DLM through Google Slides and Pear Deck for enhancing pedagogy, teaching performance, and meeting individual student needs.

**Table 6**
*Level of acceptability of DLM as evaluated by the teachers in Perceived Ease of Use*

| B. Perceived Ease of Use | *M* | *SD* | Descriptive Interpretation |
|---|---|---|---|
| 1. It is easy to become skillful at using DLM using Google Slides and Pear Deck. | 3.63 | 0.49 | Strongly Agree |
| 2. I find it easy to apply the DLM using Google Slides and Pear Deck in my class. | 3.56 | 0.51 | Strongly Agree |
| 3. Use of DLM using Google Slides and Pear Deck is easy and understandable. | 3.59 | 0.55 | Strongly Agree |
| 4. Use of DLM using Google Slides and Pear Deck is more flexible to teach than the traditional one. | 3.67 | 0.48 | Strongly Agree |
| Overall | 3.61 | 0.51 | Strongly Agree |

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Table 6 shows the evaluation of the level of acceptability of Digital Learning Materials (DLM) by teachers in terms of Perceived Ease of Use using Google Slides and Pear Deck, it's noteworthy to observe the highest and lowest mean scores among the provided items. The item with the highest mean score is "Use of DLM using Google Slides and Pear Deck is more flexible to teach than the traditional one" with a mean score of 3.67, indicating a strong level of agreement among teachers. While it's possible to gather feedback without utilizing technology such as Pear Deck, instructors may only receive responses from a few students simultaneously, limiting the scope of feedback. In contrast, when the entire class is prompted to respond to online questions displayed on the screen with the assurance of anonymity, students tend to participate confidently, thus encouraging even shy students to engage. Conversely, the item with the lowest mean score is "I find it easy to apply the DLM using Google Slides and Pear Deck in my class" with a mean score of 3.56, still falling within the "Strongly Agree" category. Despite this minor variation, all mean scores suggest a high degree of acceptability and positive perception regarding the ease of using DLM with Google Slides and Pear Deck in educational settings. This aligns with the overarching trend of strong agreement reflected in the overall mean score of 3.61, coupled with a relatively low standard deviation of 0.51, indicating a consensus among teachers regarding the perceived ease of use. A standard deviation of 0.51 indicates the average amount of deviation or dispersion of individual responses from the mean score of 3.61, suggesting relatively low variability among respondents' perceptions of the ease of using Dynamic Learning Maps with Google Slides and Pear Deck.

**Table 7**
*Level of acceptability of DLM as evaluated by the teachers in Attitude Toward Using*

| C. Attitude Toward Using | *M* | *SD* | Descriptive Interpretation |
|---|---|---|---|
| 1. Use of DLM using Google Slides and Pear Deck in class is good. | 3.59 | 0.50 | Strongly Agree |
| 2. Use of DLM using Google Slides and Pear Deck in class is favorable. | 3.56 | 0.51 | Strongly Agree |
| 3. It is a positive influence for me to use DLM using Google Slides and Pear Deck in class. | 3.81 | 0.40 | Strongly Agree |
| 4. I think it is valuable to use DLM using Google Slides and Pear Deck in class. | 3.67 | 0.48 | Strongly Agree |
| 5. I think it is a trend to use DLM using Google Slides and Pear Deck in class. | 3.78 | 0.42 | Strongly Agree |
| Overall | 3.68 | 0.46 | Strongly Agree |

The data provided in Table 7 indicates that teachers generally have a strongly positive attitude toward using Digital Learning Materials (DLM) specifically through Google Slides and Pear Deck in their classes. The overall mean attitude score is 3.68, which falls within the "Strongly Agree" category, suggesting a high level of acceptability. Among the individual items, the highest mean score is for the statement "It is a positive influence for me to use DLM using Google Slides and Pear Deck in class with the mean of 3.81, indicating that teachers strongly perceive the positive impact of these tools on their teaching practices. Pear Deck empowers educators by providing them with the capability to seamlessly embed interactive questions directly within their presentation slides, fostering active engagement and facilitating real-

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


time participation among students. This feature enhances the interactivity and effectiveness of educational content, allowing teachers to gauge comprehension, promote critical thinking, and tailor their teaching strategies to meet the diverse needs of learners.

The lowest mean score, though still indicating strong agreement, is for the statement "Use of DLM using Google Slides and Pear Deck in class is favorable", having the mean score of 3.56. The standard deviations across all items are relatively low, ranging from 0.40 to 0.51, indicating a relatively high level of agreement among the respondents. A standard deviation of 0.46 indicates that the attitudes of the teachers toward using Digital Learning Materials (DLM) with Google Slides and Pear Deck in class are relatively consistent and tightly clustered around the overall mean score of 3.68, reflecting a high level of agreement among respondents. This data suggests that teachers overwhelmingly view the use of DLM through Google Slides and Pear Deck as beneficial and valuable tools in their teaching practices, highlighting their acceptance and endorsement of these technologies for enhancing classroom instruction.

**Table 8**
*Level of Acceptability of DLM As Evaluated by the Teachers in Intention to Use*

| D. Intention to Use | *M* | *SD* | Descriptive Interpretation |
|---|---|---|---|
| 1. I tend to use DLM using Google Slides and Pear Deck in my class. | 3.56 | 0.51 | Strongly Agree |
| 2. I increase the occurrences of DLM using Google Slides and Pear Deck in class. | 3.59 | 0.50 | Strongly Agree |
| 3. Use of DLM using Google Slides and Pear Deck in my class enhances students' learning interest. | 3.81 | 0.40 | Strongly Agree |
| 4. I'd love to use DLM using Google Slides and Pear Deck in my class. | 3.67 | 0.48 | Strongly Agree |
| 5. I use DLM using Google Slides and Pear Deck to provide multi-approaches on teaching. | 3.81 | 0.40 | Strongly Agree |
| Overall | 3.69 | 0.46 | Strongly Agree |

The data provided in Table 8 indicates a strong level of intention among teachers to use Digital Learning Materials (DLM) through Google Slides and Pear Deck in their classes, with an overall mean score of 3.69, falling within the "Strongly Agree" category. Among the individual items, the highest mean scores are tied between the statements "Use of DLM using Google Slides and Pear Deck in my class enhances students' learning interest" and "I use DLM using Google Slides and Pear Deck to provide multi-approaches on teaching," both with a mean of 3.81. These responses suggest that teachers strongly believe in the efficacy of these tools for enhancing student engagement and providing varied teaching approaches. It underscores the promising prospect of Pear Deck in elevating students' academic performance within the context of online education, suggesting that its implementation may lead to enhanced learning outcomes. This statement implies that Pear Deck holds the capacity to positively impact student achievement through its unique features and interactive functionalities tailored for online learning environments. The lowest mean score, though still indicating strong agreement, is for the statement "I tend to use DLM using Google Slides and Pear Deck in my class" with a mean of 3.56. However, all mean scores fall within the "Strongly Agree" range, indicating a

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


consistent positive attitude towards incorporating DLM in teaching practices. Additionally, the relatively low standard deviations across all items (ranging from 0.40 to 0.51) suggest a high level of agreement among respondents, further affirming the strong intention among teachers to utilize these technologies for educational purposes. A standard deviation of 0.46 suggests that the attitudes of teachers towards using Digital Learning Materials (DLM) via Google Slides and Pear Deck exhibit relatively low variability, indicating a high level of consensus among respondents regarding their intention to use these tools.

*Level of Usability of the LMRH as Evaluated by Experts and Teachers*

Usability testing assesses the ease of use and overall user experience of an interactive system, focusing on identifying potential usability challenges and collecting essential usability data.

**Table 9**
*Level of Usability of the LMRH as evaluated by the IT Experts*

| System Usability Scale | *M* | *SD* | Descriptive Interpretation |
|---|---|---|---|
| 1. I think that I would like to use the Learning Hub frequently. | 4.67 | 0.58 | Strongly Agree |
| 2. I found the Learning Hub to be simple. | 5.00 | 0.00 | Strongly Agree |
| 3. I thought the Learning Hub was easy to use. | 5.00 | 0.00 | Strongly Agree |
| 4. I think that I could use the Learning Hub without the support of a technical person. | 5.00 | 0.00 | Strongly Agree |
| 5. I found the various functions in the Learning Hub were well integrated. | 4.33 | 0.58 | Agree |
| 6. I thought there was a lot of consistency in the Learning Hub. | 4.33 | 0.58 | Agree |
| 7. I imagine that most people would learn to use the Learning Hub very quickly. | 5.00 | 0.00 | Strongly Agree |
| 8. I found the Learning Hub very intuitive. | 4.33 | 0.58 | Agree |
| 9. I felt very confident using the Learning Hub. | 5.00 | 0.00 | Strongly Agree |
| 10. I could use the Learning Hub without having to learn anything new. | 4.67 | 0.58 | Strongly Agree |
| Overall | 4.73 | 0.29 | Strongly Agree |
| SUS Score | 93.33 | | Excellent |

Table 9 illustrates the System Usability Scale (SUS) of LMRH as evaluated by the experts. According to an evaluation by IT experts, the Learning Hub's overall usability rating is 4.73. ISO 9241–11:2018 (Ergonomics of Human-System Interaction) defines usability as the degree to which a product enables specified users to achieve their intended goals effectively, efficiently, and satisfactorily within a given context.

Specifically, all experts agreed that the hub is simple and easy to use with a mean of 5.00. The various functions were all integrated, consistent and intuitive with a rating of 4.33. Consistency in the user interface can improve accessibility and usability for all users. Moreover, experts concluded with a rating of 4.67 that the hub could be used without having to learn anything new.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


It was found that the perceived usability of the evaluated Learning Hub is at an excellent level, having an SUS score of 93.33.

**Table 10**
*Level of Usability of the LMRH as evaluated by the Teachers*

| System Usability Scale | *M* | *SD* | Descriptive Interpretation |
|---|---|---|---|
| 1. I think that I would like to use the LMRH Hub frequently. | 4.00 | 0.00 | Agree |
| 2. I found the LMRH to be simple. | 3.96 | 0.19 | Agree |
| 3. I thought the LMRH was easy to use. | 3.89 | 0.42 | Agree |
| 4. I think that I could use the LMRH without the support of a technical person. | 4.00 | 0.00 | Agree |
| 5. I found the various functions in the LMRH were well integrated. | 3.96 | 0.19 | Agree |
| 6. I thought there was a lot of consistency in the LMRH. | 3.93 | 0.27 | Agree |
| 7. I imagine that most people would learn to use the LMRH very quickly. | 4.00 | 0.00 | Agree |
| 8. I found the LMRH very intuitive. | 3.96 | 0.19 | Agree |
| 9. I felt very confident using the LMRH. | 3.96 | 0.19 | Agree |
| 10. I could use the LMRH without having to learn anything new. | 3.96 | 0.19 | Agree |
| Overall | 3.96 | 0.17 | Agree |
| SUS Score | 74.07 | | GOOD |

The findings presented in Table 10 indicate that teachers perceive the Learning Materials Repository Hub (LMRH) as highly usable and user-friendly, with an overall System Usability Scale (SUS) score of 3.96 and an *SD* of 0.17. The relatively low standard deviation suggests a high level of agreement among respondents, reinforcing the consistency of positive perceptions regarding the platform's usability. Furthermore, the SUS score of 74.07, categorized as "GOOD," validates the effectiveness of the LMRH in supporting educational delivery and digital learning. This suggests that teachers generally find the system functional and effective in facilitating access to digitized learning materials.

A closer examination of individual survey items reveals that all usability aspects were rated above 3.89, confirming strong agreement on key factors such as simplicity, ease of use, integration of functions, consistency, intuitiveness, and confidence in using the platform. Teachers found the system intuitive and easy to navigate, requiring minimal effort to learn and use effectively. The integration of functions within the platform ensured seamless usability, allowing users to efficiently access and manage educational materials. The consistent design and intuitive interface contributed to a smooth user experience, making it easier for teachers to adopt the LMRH in their educational practices. Additionally, the high ratings on confidence in using the platform indicate that teachers were comfortable navigating and utilizing the system without extensive training or technical support.

The broader scope of the LMRH may have introduced challenges in standardization, navigation, and content accessibility, which could explain why some teachers rated it slightly lower. Teachers handling different subjects may have encountered varying levels of ease in accessing materials relevant to their disciplines. Additionally, the learning curve for navigating a multi-subject repository may be more complex compared to a subject-specific platform. Despite

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


these challenges, the findings suggest that the LMRH remains a functional and effective digital repository that can support K-12 educators in managing and accessing educational resources.

To further enhance user satisfaction and system usability, several improvements could be considered. First, optimizing content organization by refining the classification of materials per subject and grade level would facilitate quicker retrieval of relevant resources. Additionally, enhancing navigation features through improved search and filter functions could provide a more intuitive and user-friendly browsing experience. Teachers may also benefit from short training sessions or video tutorials that introduce the platform's functionalities and guide them in maximizing its features. Furthermore, introducing customization options, such as subject-specific interfaces or adaptive features that cater to different educators' preferences, could improve overall usability and acceptance.

The findings confirm that the Learning Materials Repository Hub (LMRH) is highly usable and positively received by teachers, as reflected in its consistent high ratings and a "GOOD" SUS score of 74.07. However, when compared to a subject-specific learning hub that received a higher usability rating, it becomes evident that LMRH could benefit from refinements in content organization, navigation, and customization. Despite these areas for enhancement, the study demonstrates that the LMRH is a valuable digital repository for educational materials and has strong potential for continued adoption and improvement in supporting K-12 education.

## Discussion

The development of Digitized Learning Materials (DLMs) and the Learning Materials Repository Hub (LMRH) followed a structured research-driven approach to enhance educational delivery in digital learning environments. The process included planning, development, validation, usability testing, and implementation, ensuring alignment with DepEd's MELCs and ADMLR standards. Graduate School students developed interactive DLMs using Google Slides and Pear Deck, which were validated by subject-matter experts. The LMRH served as a centralized platform for organizing and sharing materials, incorporating user-friendly navigation, search functions, and compatibility across devices. Future enhancements, including customization features and learning analytics, will further improve usability and effectiveness.

The findings of this study highlight the effectiveness and usability of the Learning Materials Repository Hub (LMRH) in supporting digital learning for K-12 education. The evaluation of the Digitized Learning Materials (DLMs) by both teachers and experts revealed high satisfaction levels across multiple dimensions, including content quality, educational effectiveness, technical usability, and structural integrity. While the results indicate strong positive perceptions, areas for refinement were also identified, emphasizing the need for continuous improvement in educational materials to enhance their relevance, accessibility, and pedagogical impact.

Teachers and subject-matter experts highly rated the quality of the DLMs, particularly in their alignment with the Most Essential Learning Competencies (MELCs) and Alternative Delivery Mode Learning Resource (ADMLR) standards set by the Department of Education (DepEd). The materials received "Very Satisfactory" ratings in aspects such as content accuracy, logical organization, and inclusivity. However, a slightly lower rating was observed in the criterion of real-life application, suggesting the need to further contextualize learning materials to reflect authentic, real-world experiences. This finding aligns with prior research indicating that educational resources are more effective when they establish strong connections between theoretical knowledge and practical application (Bates, 2019). Moreover, Moskalenko (2023) found that the digital visualization of educational content for future mathematics teachers received positive evaluations. The integration of digital tools not only enhances the clarity and engagement of mathematical concepts but also ensures that educational materials align

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025



with established educational frameworks. This approach supports effective teaching strategies, fostering better comprehension and application of mathematical principles among learners.

In terms of educational quality, the study found that the DLMs were well-structured, engaging, and adaptable for both synchronous and asynchronous teaching. Teachers appreciated the integration of Pear Deck with Google Slides, which enhanced interactivity and formative assessment opportunities. The immediate feedback mechanism of Pear Deck was particularly valued, as it facilitated active student engagement, real-time formative assessment, and differentiated instruction, aligning with findings by Randall et al. (2023) that emphasize the role of interactive technology in fostering student participation. Sametova et al. (2022) highlighted the effectiveness of well-structured digital educational resources in teaching Russian language and literature. These resources incorporate video tutorials, audio materials, and interactive tasks, designed to capture students' attention and enhance engagement, particularly in remote learning environments. The study emphasizes the importance of digital tools in maintaining student interest while supporting both synchronous (live) and asynchronous (self-paced) teaching methods. This flexibility allows educators to adapt their educational strategies based on student needs and lesson contexts, ensuring effective and personalized learning experiences.

The usability assessment of the LMRH yielded positive results, with teachers and IT experts expressing strong agreement regarding the system's simplicity, ease of navigation, and functionality. The System Usability Scale (SUS) score of 74.07 categorizes the platform's usability as "Good," reinforcing its effectiveness in facilitating digital educational resource management. The study of Estrada-Molina et al. (2021) recognized that a well-designed digital platform enhances educational delivery by making learning materials easier to navigate and use. However, when compared to the Santos et al. (2023) study, where a similar hub designed for a specific subject area scored 88.02 ("Best Imaginable"), the LMRH received a lower usability score. This discrepancy suggests that multi-subject digital repositories, like the LMRH, may face greater challenges in standardization and user experience compared to subject-specific repositories that cater to a more specialized audience.

Additionally, IT experts rated the system exceptionally high, with an SUS score of 93.33 ("Excellent"), emphasizing the seamless integration of functions and the minimal learning curve required for users. Teachers also strongly agreed that the LMRH was intuitive, functionally cohesive, and easy to use without technical support. These findings support the study of Sametova et al. (2022) wherein digital educational resources have been rated highly by educators, indicating that the system is user-friendly and effective. Teachers found the platform intuitive, which suggests that they could navigate and utilize the resources without extensive training or technical support. However, areas such as content organization and search functionality could be refined to further enhance user accessibility and navigation. Prior research suggests that efficient content retrieval mechanisms significantly impact user satisfaction and system adoption (Dwivedi et al., 2017).

Teachers' Perception of Digital Learning Materials (DLMs) and Interactive Tools Teachers strongly endorsed the usability and effectiveness of DLMs integrated into the LMRH, particularly in terms of perceived usefulness, ease of use, attitude toward using, and intention to use. The overall mean ratings exceeded 3.65 ("Strongly Agree"), confirming that teachers found the DLMs to be valuable educational resources that enhance pedagogical flexibility and student engagement. The highest rating was observed in "Use of DLM using Google Slides and Pear Deck enhances teaching performance" (mean = 3.74), underscoring teachers' confidence in the platform's ability to improve lesson delivery and learning outcomes. The findings of this study resonated with the study of Vidal-Esteve and Martín-Gómez (2023) which stated that teachers strongly endorse digital didactic materials, recognizing their usefulness in enhancing pedagogy and student engagement. They find digital learning materials easy to integrate, reflecting a broader confidence in technology. While specific tools aren't highlighted, educators critically

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


assess digital resources, ensuring their effectiveness for early childhood and primary education. However, in the study of Byeon (2024) teachers expressed mixed feelings about the usability and effectiveness of the intelligent science lab platform. Many reported low usability, which hindered their ability to integrate the platform into their lessons effectively.

The ease of use of the DLMs was also highly rated, with teachers appreciating the flexibility and accessibility provided by the digital format. A notable finding was the positive impact of Pear Deck in increasing student engagement, as supported by studies indicating that interactive learning tools encourage active participation and provide educators with valuable real-time feedback on student understanding (Javed & Odhabi, 2018). Teachers also expressed strong intention to continue using DLMs ($M$ = 3.69), reinforcing the platform's sustainability and long-term adoption potential. Similarly, in the study of Sia and Mohamad (2023), teachers appreciate digital learning tools for their ease of use, flexibility, and positive impact on student engagement. They strongly support long-term adoption but face challenges like training gaps and technical issues. Addressing these concerns through institutional support and resource investment is essential for maximizing the benefits of digital education.

While the LMRH performed well in usability and teacher acceptance, its comparatively lower SUS score than the Santos et al. (2023) learning hub suggests areas for improvement. The broader subject coverage of the LMRH may have contributed to diverse teacher perceptions regarding its efficiency, particularly in terms of customization and subject-specific usability. To further enhance the platform, subject-specific filtering, advanced search options, and customizable user dashboards could be integrated to cater to teachers' specific educational needs. Similar results from the study of Schoors et al. (2022), wherein enhancing digital personalized learning (DPL) platforms requires subject-specific filtering, advanced search options, customizable dashboards, learning analytics, and professional development resources. These features enable teachers to tailor education, track student progress, and improve engagement. Integrating these tools fosters data-driven teaching strategies, enhancing personalized learning and overall educational outcomes.

Furthermore, the findings highlight the importance of structured content curation to facilitate ease of use. Aurangzeb et al. (2024), in their study, mentioned that structured content curation enhances technology adoption by improving perceived ease of use (PEoU) and perceived usefulness (PU) among teachers. It aligns with the Technology Acceptance Model (TAM) by making digital resources intuitive and relevant. Additionally, structured curation supports training programs and fosters inclusive technology integration in education. While previous research suggests that well-organized repositories with intuitive design elements significantly enhance user satisfaction (Youngblood & Youngblood, 2013). Enhancing visual aesthetics, providing content previews, and offering guided tutorials may further improve user experience and adoption rates.

## Conclusions and Implications

This study has successfully developed and validated Digitized Learning Materials (DLMs) and the Learning Materials Repository Hub (LMRH) as innovative solutions to enhance educational delivery in digital and blended learning environments. The research has established the pedagogical effectiveness of the DLMs, which were designed using Google Slides integrated with Pear Deck, ensuring interactive and engaging learning experiences. These materials were evaluated by subject-matter experts and confirmed to be aligned with the Most Essential Learning Competencies (MELCs) and Alternative Delivery Mode Learning Resource (ADMLR) standards, meeting high educational quality standards.

Furthermore, the study has developed and implemented the LMRH, a centralized digital repository that allows teachers to store, organize, and access educational materials efficiently.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


The platform was assessed through usability testing, where teachers and IT experts confirmed its functionality, ease of navigation, and user-friendliness. While the System Usability Scale (SUS) score of 74.07 ("Good") affirmed its effectiveness, the study also identified areas for improvement, particularly in subject-specific customization, search optimization, and content filtering to enhance its adaptability across diverse disciplines.

The findings of this research have confirmed the critical role of structured digital repositories in improving resource accessibility, educational efficiency, and teacher engagement in online learning environments. The study also highlights the importance of continuous innovation and refinement in digital education platforms to meet evolving educational needs.

For future educational practice, the integration of learning analytics, AI-driven recommendations, and enhanced search functionalities is recommended to further personalize and optimize the user experience. Additionally, expanding teacher training programs on digital educational material development will ensure the sustained adoption and effective utilization of platforms like the LMRH. Future research may explore the impact of digital learning repositories on student learning outcomes and investigate how adaptive technologies can further support differentiated instruction.

This study has successfully developed, validated, and implemented a comprehensive digital learning repository, demonstrating its potential to transform educational resource management and improve digital learning experiences. By addressing the identified areas for enhancement, the LMRH can serve as a sustainable and scalable educational technology solution, supporting the ever-evolving needs of 21st-century education.

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## Declaration of Interest

The authors declare no competing interest.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025
260

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


# PARENTS' AND TEACHERS' PERCEPTION OF EFFECTIVE COMMUNICATION AS A MEANS OF PARENTS' INVOLVEMENT IN SCHOOL WORK

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## Abstract

*Effective communication between parents and teachers results in numerous benefits for all participants in the communication process and, consequently, for the child. The aim of the research was to determine the perceptions of parents and teachers about what constitutes effective communication. For this purpose, 156 primary school teachers and 163 parents in the Republic of Croatia responded to the Murphy questionnaire via Google Forms. The questionnaire consists of two parts: a sociodemographic part and a part of questions that include parental involvement and teacher-parent interaction. The purpose of the research was to guarantee the respondents ' anonymity and allow them to withdraw at any time. The research reveals that primary school teachers fail to meet parents' expectations in communication, emphasizing the need to improve regular communication and plan curriculum components that include ways of parental involvement through various means of communication. This research emphasizes the importance of effective communication and parental involvement in the educational environment, which would contribute to the development of partnership relationships.*
**Keywords**: *effective communication, parental involvement, school-family partnership, primary education*

## Introduction

In educational institutions, the quality of the relationship between parents and teachers is shaped by a range of factors, including two-way and open communication (Hornby, 2000), mutual trust, voluntary parental engagement, aligned values in the upbringing and education of the child, and ultimately, a shared focus on the child's well-being (Epstein et al., 2002; Hoover-Dempsey & O'Connor, 2002; Hornby & Greaves, 2022). The researchers emphasize that active parental participation in school activities contributes to improving children's academic success (Jeynes, 2024; Li & Vachon, 2023; Ogg & Anthony, 2020; Otani, 2020; Yu et al., 2022), as well as benefits for teachers and parents. Furthermore, quality relationships among adults operating in the child's environment significantly contribute to children's development (Bierman & Sheridan, 2022). In the process of involving parents in the school, it is of utmost importance for teachers to understand parents' expectations regarding the educational system (Alharthi, 2023; Bruïne et al., 2014; Jeynes, 2024).

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Hornby and Greaves (2022) highlighted the importance of considering parents' expectations through the lens of Hornby's model of involvement, which emphasizes that parental involvement is based on respecting the needs of both teachers and parents, as well as on equality in decision-making that is significant for the child's development (Hornby, 2000). Rattenborg et al. (2019) stressed the need for jointly establishing rules regarding responsibility towards the child, as well as for clearly defining the roles of parents and teachers within the school environment. Epstein et al. (2002) believed it is crucial to define the strengths and weaknesses of the interaction between parents and teachers, and to establish a vision of the school that is oriented towards actively involving parents. To make the interaction between parents and teachers as effective as possible, Hoover-Dempsey and O'Connor (2002) suggested guidelines for schools that would encourage more frequent parental involvement in school activities. One of these guidelines encompasses the importance of direct and clear communication with parents about the significance of their involvement, including creating opportunities for interactive communication and valuing parents' suggestions and ideas.

Major (2023) emphasized the critical importance of communication between parents and teachers in promoting favorable outcomes associated with parental involvement. Within the context of qualitative research, semi-structured interviews were conducted with 31 educators working in primary schools, and the subsequent analysis was performed using Atlas.ti software. The findings indicate that regular communication, the utilization of a shared language, a positive disposition from both parties, and the judicious application of information and communication technology tools are vital for effective communication. Moreover, it is essential to provide parents with feedback regarding the results of their involvement and its influence on their child's educational achievements, as well as to enhance the communication skills of both teachers and parents (Amanova, 2023; De Coninck et al., 2023), which are integral to fostering effective communication.

### *Effective Communication Between Parents and Teachers*

A person is inherently a social being, possessing an intrinsic need to communicate in various forms. Each spoken word that constitutes communication embodies a specific thought and concept that the speaker intends to convey regarding a particular situation or issue (Watzlawick, 1978). The interlocutor may either concur with or contest the message received; consequently, the participants in the dialogue may hold differing perspectives on the content of the communication. A shared understanding of messages fosters effective communication, which is a developmental process essential for cultivating mutual relationships (Bierman & Sheridan, 2022; Deslandes et al., 2023). The effectiveness of communication between teachers and parents is influenced by a multitude of factors, including the utilization of contemporary communication tools as an optimal strategy for enhancing the partnership between educational institutions and families (Bocoş & Marin, 2022; Kraft & Bolves, 2021; Major, 2023), as well as the motivation of both teachers and parents to engage in reciprocal communication (Hardiansyah & Zainuddin, 2023). Mutual beliefs about the importance of communication can improve relationships between parents and teachers (Abubakari, 2020; Bordalba & Bochaca, 2019; Lyu, 2023; Wasserman & Zwebner, 2017; Wu et al., 2023).

Hardiansyah and Zainuddin (2022) underscored the notion that the efficacy of communication between teachers and parents significantly enhances the impact of teachers. The participants in their study indicate that such communication can occur through a variety of channels, including telephone calls, internet platforms, chat applications, electronic mail, written correspondence, meetings, and workshops. Moreover, the findings of the study reinforce the critical role of communication as a determinant in the attainment of organizational objectives. Consequently, it is imperative for educational institutions to prioritize the communication

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


between parents and teachers, as any existing communication gap may adversely affect the performance outcomes of the school.

The findings of an ethnographic study conducted by Conus & Fahrni (2019) within a Swiss educational setting illuminated a prevailing paradox that bears adverse consequences for the development of the family-school relationship. Teachers often embrace the communication principle that "no news is good news," thereby placing the onus on parents to initiate interactions. However, parents not only anticipate that teachers will take the initiative in these communications but also encounter numerous structural and socio-emotional obstacles that impede effective dialogue. The authors, drawing upon their research findings, assert that educational institutions and teachers must reevaluate their roles in routine communication and strive to eliminate barriers in alignment with the communication needs of parents.

Leenders et al. (2019) asserted the significance of fostering robust relationships between parents and teachers. Their research, which encompasses 55 interviews conducted with teachers across various educational institutions, reveals that two-way communication is predominantly employed in schools characterized by a heightened risk of peer violence. Furthermore, the findings indicate that teachers often encounter challenges in engaging parents in the decision-making processes pertaining to specialized care for their children. The authors highlighted that the efficacy of the relationship between teachers and parents is most pronounced when addressing specific topics of discussion. They underscore the necessity for teachers to cultivate a heightened awareness of their professional responsibilities, thereby alleviating any difficulties associated with two-way communication and mitigating apprehensions related to addressing conflicts involving students.

Vasarik Staub et al. (2023) explored the dynamics of communication and collaboration between educational institutions that have implemented personalized learning concepts and the families of their students. A qualitative analysis of a longitudinal mixed-methods research project resulted in the development of an analytical instrument based on the study of partnerships between schools and families. This instrument encompasses five key communication and collaboration structures, including a channel for two-way information exchange and collaboration, the flow of information from schools to parents, a core event, parent volunteering, and parental involvement in decision-making. Three types of schools have been identified, differing according to the dominant forms of communication and collaboration: informal communication and collaboration, reactive communication and collaboration, and strategic communication and collaboration. Moreover, it is imperative to guide parental engagement towards matters pertaining to education and to guarantee that parents are afforded the opportunity to participate in decision-making processes.

The findings of the research by Chatzinikola (2022) indicated that teachers regard the invitation for parents to visit the school as exceedingly important. Moreover, it is deemed essential to communicate with parents through various channels, including telephone, email, or informational messages. Additionally, both principals and elementary school teachers underscore the significance of the initial meeting between teachers and parents within the school setting. The primary objective of this meeting is to provide parents with timely information regarding the school's mission. It is conveyed to parents that both teachers and parents share a collective responsibility for the students' academic progress. Furthermore, Chatzinikola (2021) highlighted that active listening constitutes a fundamental skill in effective communication, which teachers employ in their interactions with the parents of their students. The empirical research involved 222 teachers and 33 principals of elementary school departments. Teachers emphasized that in their communication with parents, they apply active listening, accept parental statements, maintain a neutral stance, and show empathy in order to share their thoughts and feelings. Furthermore, during the application of active listening as a skill for effective communication between teachers and parents, teachers highlighted the importance of their verbal interventions.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


In this way, they ask open and closed questions for clarification and repeat key points made by parents without expressing personal opinions. During their verbal positioning, teachers first highlight the positive traits of the children and then focus on their learning weaknesses.

Stamatis and Chatzinikola (2021) examined the barriers that hinder communication between teachers and parents. In this study, two hundred and twenty-two teachers and thirty-three primary school principals participated, highlighting the importance of communication with parents. According to their findings, this communication contributes to creating a sense of security among students, as well as improving their learning and behavioral skills. Teachers are convinced that effective communication between teachers and parents benefits the school unit itself, thereby increasing its overall effectiveness. However, teachers have identified several reasons that complicate communication with parents. These reasons include parents' lack of time to visit the school department, low social or educational background of the parents, as well as poor performance or behavior of their children. Teachers do not agree with the claim that the structure of the educational system poses a barrier to their communication with parents, emphasizing. Ultimately, teachers contend that guidance is of paramount importance, as it serves to mitigate challenges that obstruct effective communication between teachers and parents.

### *Research Focus*

This research focuses on identifying the effective communication between parents and educational professionals. Starting from the premise that communication is a potential source of problems but also solutions, identifying communication patterns between parents and educational professionals provides a valid scientific and research framework for further scholarly research of this issue, as well as practical actions within the educational institutions themselves.

### *Research Aim and Research Questions*

The aim of this research was to ascertain how parents and teachers in the Republic of Croatia view effective communication, whether they have different opinions about the elements that contribute to the communication process, and whether these elements influence parents' involvement in schoolwork. Specifically, the research aimed to answer these questions:

1. What are the differences between parents and teachers in their perceptions of the frequency of use of various communication channels?
2. Do parents and teachers differ in their emotional responses towards different communication modalities?

## Research Methodology

### *General Background*

Students achieve academic success and emotional growth when parents communicate effectively with their teachers. Combining open communication with regular updates leads to increased parental involvement, producing better student results (Epstein et al., 2002; Hornby & Greaves, 2022). The relationship between parents and teachers suffers when their educational expectations differ (Conus & Fahrni, 2019). The key components of successful communication consist of trust between parties, attentive listening, straightforward feedback and multiple communication channels, including email, phone and digital platforms (Kraft & Bolves, 2021; Major, 2023). Structural and social barriers and conflicting views on communication frequency and effectiveness create ongoing challenges (Leenders et al., 2019). The study examines how

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Croatian primary school parents and teachers define effective communication to develop better strategies for enhancing school-family partnerships.

The research was conducted using a quantitative methodology. The data collected through structured questionnaires provided valuable insights into the perceptions of both parents and teachers regarding their communication practices. The data collection was carried out between April and October 2024.

### *Sample*

The research sample consisted of 156 primary school teachers (145 women – 92.9%, 11 men – 7.1%, 114 urban – 73.1%, 42 rural – 26.9%) and 163 parents (153 women – 94%, 10 men – 6%, 135 urban – 82.8%, 28 rural – 17.2%) from various regions in Croatia. The sample size was determined based on accessibility and previous studies (Mestry & Grobler, 2007; Patton, 2019) with similar sample ranges, aiming to ensure adequate statistical power for non-parametric comparative analysis. The sampling was non-probabilistic, and the sample included diversity in participants' gender and geographical location (urban/rural), contributing to the findings' credibility and transferability.

Participants were selected using purposive sampling, targeting primary schools and parent networks. Before conducting research, principals in 31 Croatian schools were contacted for agreement for their teachers and parents of children from that school to participate in the research. 12 schools refused to participate, while the rest agreed to proceed with our invitation to parents and teachers. To participate in research, potential participants must meet research inclusion criteria. Inclusion criteria required that participants (a) be current primary school teachers or parents of children enrolled in Croatia and (b) express a willingness to participate voluntarily in the research. This ensured that all respondents had direct experience with the communication processes under investigation. Everyone who signed an agreement for participation and provided their e-mail address got an online invitation for research participation. In total, 977 e-mails were sent. 416 participants filled out a questionnaire, while 319 were valid. Declined and uninvolved questionnaires were not used in further research because of repeated answers.

Participants were guaranteed anonymity, the use of data for scientific purposes was explained to them, and they were given the option to withdraw from the study at any time without providing a reason.

### *Instrument and Procedures*

The research instrument consisted of two parts. The first part included a sociodemographic questionnaire that gathered data on participants' gender, role, and place of residence.

The second part was a translated and adapted version of Murphy's (2009) questionnaire, designed to assess parent-teacher communication and parental involvement. The questionnaire was translated into Croatian using the back-translation method to ensure linguistic accuracy and conceptual equivalence (Harkness et al., 2004). It contained 21 items measuring the frequency and satisfaction with various communication channels, including informal meetings, telephone, mobile phone, email, and individual meetings.

Participants responded using a 4-point Likert scale for frequency (1 – never, 2 – sometimes, 3 – often, 4 – very often) and satisfaction (1 – never, 2 – sometimes, 3 – frequently, 4 – very often).

Separate versions of the questionnaire were developed for teachers and parents and adapted to reflect their specific roles in the communication process. While the core structure remained similar, certain items were modified to suit each group's perspective. Both groups used the same Likert-type questionnaires.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


Two independent experts in educational communication reviewed the questionnaire to ensure content validity, thus confirming that the items accurately represent the construct being measured and are appropriate and relevant for the target population. Reliability was assessed using Cronbach's alpha, with results indicating high internal consistency: $\alpha = .89$ for teachers and $\alpha = .92$ for parents.

Data were collected through an *online* Google Forms survey between April and October 2024.

### *Data Analysis*

The participants' sociodemographic data were analyzed using descriptive statistics and presented in percentages. Inferential statistics were used to examine differences between the two groups, employing non-parametric statistical tests. The Kolmogorov–Smirnov test was applied to examine the normality of the data distribution. The results indicated a non-normal distribution, which justified the use of non-parametric statistical procedures.

The Mann–Whitney U test was utilized to compare the differences in perceptions of communication between teachers and parents. This test is appropriate for comparing two unpaired groups when a normal distribution cannot be assumed.

The collected data were processed using IBM SPSS Statistics 29.0 (SPSS, Chicago, IL, USA).

## Research Results

The Mann–Whitney *U* test was conducted to analyze differences in communication frequency (Table 1). Results revealed statistically significant differences in several variables, with teachers reporting more frequent communication than parents. The data indicate that teachers consistently reported more frequent use of communication methods, especially regarding telephone calls and electronic communication, where the differences reached the highest level of statistical significance ($p<.001$).

**Table 1**
*Differences in Communication Frequency*

| Variables | Group | *M* | *SD* | *U* | *Z* |
|---|---|---|---|---|---|
| Telephone communication frequency | Parents | 2.25 | 0.88 | 8277.5 | 21643.5*** |
| | Teachers | 2.85 | 0.97 | | |
| Individual meetings frequency | Parents | 3.00 | 0.82 | 12461.0 | 25827.0 |
| | Teachers | 3.04 | 0.75 | | |
| Written communication frequency | Parents | 2.49 | 0.84 | 11815.5 | 25181.5 |
| | Teachers | 2.60 | 0.86 | | |
| Outgoing calls | Parents | 1.72 | 0.64 | 6823.5 | 20189.5*** |
| | Teachers | 2.40 | 0.77 | | |
| Non-formal meetings | Parents | 1.58 | 0.77 | 9663.0 | 23029.0*** |
| | Teachers | 1.97 | 0.91 | | |
| E-communication (e-mail, web) | Parents | 2.93 | 0.92 | 8321.0 | 21687.0*** |
| | Teachers | 3.49 | 0.77 | | |
| Communication frequency (overall) | Parents | 2.67 | 0.82 | 8757.5 | 22123.5*** |
| | Teachers | 3.12 | 0.73 | | |

$p < .05$*, $p < .01$**, $p < .001$***

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


In the second part of the analysis, emotional responses to different communication modalities were assessed using the Mann–Whitney *U* test (Table 2). An analysis of the data revealed that only one variable showed a statistically significant difference in the context of feelings and communication between teachers and parents. Parents reported significantly more positive perceptions of outgoing calls ($M$ = 2.73) than teachers ($M$ = 2.47). This difference suggests that teachers may feel less comfortable initiating contact with parents than vice versa regarding outgoing phone calls. Conversely, the lack of significant differences in perceptions of communication suggests a general agreement on the effectiveness of most communication channels. This may indicate a similar comfort level in using various forms of communication and could also reflect common expectations regarding communication practices.

**Table 2**
*Differences in Feelings About Different Ways of Communication*

| Variables | Group | *M* | *SD* | *U* | *Z* |
|---|---|---|---|---|---|
| Important information | Parents | 2.77 | 0.70 | 12159.5 | 25525.5 |
| | Teachers | 2.82 | 0.82 | | |
| Written communication | Parents | 2.82 | 0.72 | 12443.0 | 25809.0 |
| | Teachers | 2.85 | 0.84 | | |
| Telephone communication | Parents | 2.61 | 0.82 | 11478.5 | 23724.5 |
| | Teachers | 2.45 | 0.85 | | |
| Outgoing calls | Parents | 2.73 | 0.83 | 10576.5 | 22822.5** |
| | Teachers | 2.47 | 0.85 | | |
| Non-formal communication | Parents | 2.77 | 0.86 | 11759.5 | 25125.0 |
| | Teachers | 2.88 | 0.83 | | |
| Communicating via e-mail/web | Parents | 2.90 | 0.79 | 11699.0 | 25065.0 |
| | Teachers | 3.01 | 0.82 | | |
| Communication in general | Parents | 2.83 | 0.79 | 12173.0 | 25539.5 |
| | Teachers | 2.86 | 0.82 | | |
| Speaking important information | Parents | 2.83 | 0.78 | 11743.0 | 23989.0 |
| | Teachers | 2.86 | 0.81 | | |
| Discussing pupil-specific issues | Parents | 2.82 | 0.76 | 12033.5 | 24279.5 |
| | Teachers | 2.70 | 0.77 | | |
| Phone conversations regarding issues | Parents | 2.21 | 0.91 | 12654.5 | 24900.5 |
| | Teachers | 2.17 | 0.80 | | |
| Informal problem discussions | Parents | 2.23 | 0.87 | 12236.0 | 24482.0 |
| | Teachers | 2.15 | 0.79 | | |
| Digital problem communication | Parents | 2.39 | 0.90 | 12080.5 | 24326.5 |
| | Teachers | 2.30 | 0.84 | | |

$p < .05$*, $p < .01$**, $p < .001$***

## Discussion

This research aimed to evaluate the perception of effective communication between teachers and parents in primary schools. Previous research by Hardiansyah and Zainuddin (2022) recognized that communication between parents and teachers can occur through various communication tools (such as the Internet, telephone, email, and informal meetings). From the current research results, it is important to highlight that teachers have a more positive

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025



perception of the frequency of communication with parents regarding all communication tools. Among these tools, individual meetings were the most frequently used by teachers and parents ($M_{parents}$ = 3.00; $M_{teachers}$ = 3.04). This finding could also have a potential regarding findings by Conus and Fahrni (2019), who determined that the relationship between school and family develops most effectively during face-to-face interactions, indicating that Croatian parents most frequently use the communication tool with the most significant potential for enhancing the effectiveness of the teacher-parent partnership. On the other hand, informal meetings were not rated as positively by teachers and parents in this study, despite their recognized potential in developing school-family relationships, according to Conus and Fahrni (2019). The elementary school environment could explain the lower number of informal meetings. Specifically, Murray et al. (2014) concluded in their research that the mode of communication from teachers to parents varies depending on the educational setting; individual meetings are more frequent in primary school environments, while informal gatherings and parent newsletters are more common in preschool settings.

A more detailed analysis of the frequency of communication tools used indicates that teachers rated the frequency of phone calls more positively ($M$ = 2.85) compared to parents (M = 2.25), with a statistically significant difference ($Z$ = 21643.5; p < .001). Additionally, teachers rated the frequency of outgoing calls more positively ($M$ = 2.40) compared to parents ($M$ = 1.72), and this difference is also statistically significant ($Z$ = 20189.5; p < .001). Furthermore, teachers assessed the frequency of informal meetings more positively (M = 1.97) compared to parents (M = 1.58), again with a statistically significant difference ($Z$ = 23029.0; p < .001). The fact that teachers perceive greater frequency of communication with parents than parents do can be explained by the continued traditional approach where teachers are the ones who initiate collaboration, which primarily relies on individual meetings (Bošnjaković & Galeković, 2022; cf. Hornby & Greaves, 2022). The previously mentioned perception could also be due to the "no news is good news" communication principle mentioned by Conus and Fahrni (2017).

Major (2023) also acknowledged the beneficial impact of communication between parents and teachers on parental involvement. Results of this research suggested that teachers generally rate the frequency of communication with parents more positively ($M$ = 3.12; p < .001) compared to the assessment of parents ($M$ = 2.67; p < .001). Murphy (2009) corroborated similar findings; his research revealed that teachers typically assess a greater frequency of successful communication compared to parents. Conus and Fahrni (2019) deemed it essential to adapt the frequency of communication between teachers and parents to better cater to parents' communication needs. Accordingly, it is relevant to consider the results of this research, which showed that parents *rate the communication frequency more negatively than teachers*. This discrepancy highlights the importance of fostering a more collaborative dialogue between educators and families. By addressing these differing perceptions, schools can implement strategies that enhance parental involvement and ensure that communication is not only frequent but also meaningful and effective. The results are significant, as prior research by Stamatis and Chatzinikola (2021) has acknowledged the frequency and importance of communication, noting that it fosters a sense of security for students, enhances their learning abilities, and improves their behavior. Moreover, fostering a positive relationship between educators and families can lead to improved student outcomes, as parents feel more empowered to support their children's education. This partnership not only benefits academic performance but also promotes a holistic approach to student well-being, reinforcing the idea that education is a collaborative endeavor. Conversely, Abubakari's (2020) research indicated that parents and teachers seek more frequent communication, which contrasts with these findings, as parents evaluated communication more unfavorably than teachers.

Teachers also rated the frequency of communication via email and websites more positively ($M$ = 3.49) compared to parents ($M$ = 2.93), with a statistically significant difference

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 83, No. 2, 2025


($Z = 21687.0$; $p < .001$). Previous research by Halsey (2005) showed that both sides can become discouraged if the perceived communication efforts differentiate. Regarding communication through digital tools, Abubakari (2020) and Bordalba & Bochaca (2019) found that both parents and teachers consider digital media useful tools and desire their greater integration into school-family communication for faster and easier information flow. Although our research did not find a statistically significant difference in attitudes towards using digital media for communication, there is a slightly more positive attitude from teachers ($M = 3.01$) compared to parents ($M = 2.90$) regarding their use.

Regarding differences in feelings about different ways of communication, a statistically significant difference was found in the assessments for the category of outgoing calls ($Z = 22822.5$; $p < .01$). Parents have a more positive perception of outgoing calls directed toward teachers ($M = 2.73$) compared to teachers ($M = 2.47$). These results may be because making individual outgoing calls is time-consuming for teachers. On the other hand, parents may find that making calls to teachers helps them resolve their issues more quickly. Previously stated results differ from the results of Murphy's (2009) research, which concluded, based on a sample of parents, that calls are not always necessary and that parents believe other methods of communication are more effective, thus avoiding the need to burden teachers with calls. This is likely because communication with teachers via other channels is satisfactory, reducing the need for calls. In Murphy's (2009) study, parents preferred email and text messages.

## Conclusions and Implications

Effective communication between the sender and the recipient of a message allows for honest and open communication. It is an example of the interchange of ideas, thoughts, and information in which the recipient receives the information in exactly the same form as the sender did. When giving negative feedback, this is particularly crucial because it is the exact thing that might endanger relationships over time. Effective communication makes it possible to focus even criticism and attempts to change someone's behavior on fostering and improving connections with others. The obtained results of this research indicate a clear need for further research into this issue, especially since communication can be considered crucial for establishing good relationships and partnerships between teachers and parents, as well as between schools and families in general. Accordingly, the practical implications of these findings suggest that identifying communication patterns at the micro-level is necessary to define an optimal communication framework, considering both the comprehensiveness of communication methods and acceptable forms and channels of communication.

The limitations of this research are in the lack of more precise parameters that would determine the effectiveness of communication between parents and teachers, which would provide a more in-depth understanding of this phenomenon. Future research should focus on more specific observations of this issue and a more detailed study of the effectiveness of teacher-parent communication. Systematic research on parental involvement in school activities will help reduce barriers to school-family partnership and ensure the positive effects of parental involvement on children.

## Declaration of Interest

The authors declare no competing interest.

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PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
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The title of the paper 14-point, bold with capital letters, align left; titles in the text (chapters) 12-point bold, not numbered; sub-titles (subchapters) 12-point, italic, not numbered. There must be 1 empty line before and after a title or a subtitle. The text chapters must be separated by 1 empty row. The title should be concise and informative. Avoid abbreviations.

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Please provide 3 to 5 keywords in alphabetical order. Note that a keyword does not have to be made of only one word. At least one of these should indicate the topic area and one should indicate the methodology of the research.

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The body of the text of the manuscript must generally have the following parts:
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- discussion;
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P.S. The structure can be different if the paper is only theoretical qualitative research.

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The manuscript should be not shorter than 6 pages (including references, tables and figures). Manuscripts should be typed on A4, in Times New Roman 12-point font size, single-spaced, 2.5 cm with all the margins, word-document (Word 6.0 or later) format.

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Acronyms should be defined the first time they appear.

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Tables and figures should be valuable, relevant, and visually attractive. Tables (made in Word or another software) and figures must be referred to in the text and numbered in the order of their appearance. Each table and figure should have a complete, descriptive title; and each table column an appropriate heading. The texts in tables and figures should be 11-point (in some cases 10) and their width should be 12 cm at maximum. The figures should be in format .jpg (unless done in Word or Excel); resolution 1200 dpi. Figures, tables (black and white colour, without ground-colour) and captions should be inserted within the manuscript at their appropriate locations. All the graphics (figures) must be editable. The font size should be Times New Roman for all figures and tables. Figures should be carefully explained in the text and cited in numerical order.
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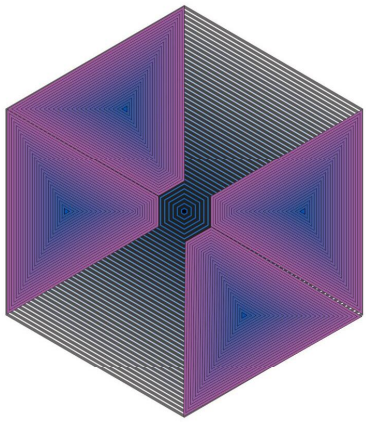
...'Education performs an important social function in society, determines social mobility, helps maintain cultural continuity, and, of course, is an important factor in economic development. Moreover, education can increase political awareness and promote active participation of citizens in political processes. Well-educated individuals often better understand political systems, their rights and duties, which can contribute to strengthening democracy. In this case, we want to emphasise the word “can” because it works differently in different societies. It is more than obvious that the interaction is dynamic and can change depending on historical, cultural, economic, and political conditions. Society and education constantly influence each other, shaping a common social reality.'...



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